ELECTRICAL REVIEW

[ILLUSTRATED.]

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The Bridgeport Brass Company—Model Offices and Rushing Business.

Copper enters into the construction of a thousand and one things that the observer not in the business cannot realize until he has visited one of the leading manufactories. A member of the staff of the REVIEW had the pleasure recently of passing through the extensive works of the Bridgeport Brass Company, and learned to appreciate the wide range of use covered by this metal and its alloy. A busier or better managed and arranged establishment he has never seen. There is employed here a staff of 350 to 400 persons busily engaged in skilled work. In the many things manufactured and daily sent out to all quarters of the world a wide field is covered. Material is modeled ranging from the little brass pins for the interior of pianos to the largest tubing, from delicate brass chains to the valuable coils of hard-drawn copper wire—a wire that is said to have had its birth in these works, and which has had so much to do with the wonderful advance in the various branches of the electrical field. In this department the Bridgeport Company has attained an enviable position. Two elements have had much to do with this—only the best material ever permitted to leave the factory, and the zealous intelligent work of Mr. Stanley, who is at the head of this department. So great has been the demand that an addition to the wire mill of a three-story building, 175x50, has been decided upon, and will be constructed at once. The entire building will then cover about three acres of ground, another acre being devoted to use as yards. These buildings are all supplied with the improved automatic fire extinguishers, which only require a raised temperature in any room to flood that point with water. Should any one of the several hundred extinguishers go off from accident or otherwise, a gong alarm is automatically sounded. Fire protection is almost absolute, and, while the cost of the plant must have been from $6,000 to $8,000, the saving in insurance, not to mention the protection, makes a gratifying return on the outlay.

The Bridgeport Company has recently occupied new offices, built at the front and connected with the factory. In their construction and arrangement good taste and abundant means are evident. The wood-work is all of solid mahogany, natural color; the desks, counters, chairs, etc., all of the same expensive material. The offices on all the floors are noticeably well lighted, and finished with every convenience. There is in this that which impresses the visitor with the fact that these Brass Works are controlled by a head that wisely considers pleasant, cheerful surroundings and personal comfort for himself and his assistants of particular value in these days of electric business methods. Without any attempt at display, but ecognizing these excellent features, Col. Fred A. Mason, for six years the financial and executive head of this company, has had constructed and furnished these elegant, well-lighted and most comfortable offices. It is with no intention to give extravagant praise that this is written, but to emphasize this excellent idea, that where means are abundant, as in this case, it is the sensible business man who provides those elements that aid in making the every-day work of himself and staff pleasant and prompt. Col. Mason has here a manufactory that is a monument to his energy and sound business methods, its every department crowded with work, its financial standing gilt-edged, and its future full of promise of additional honors.

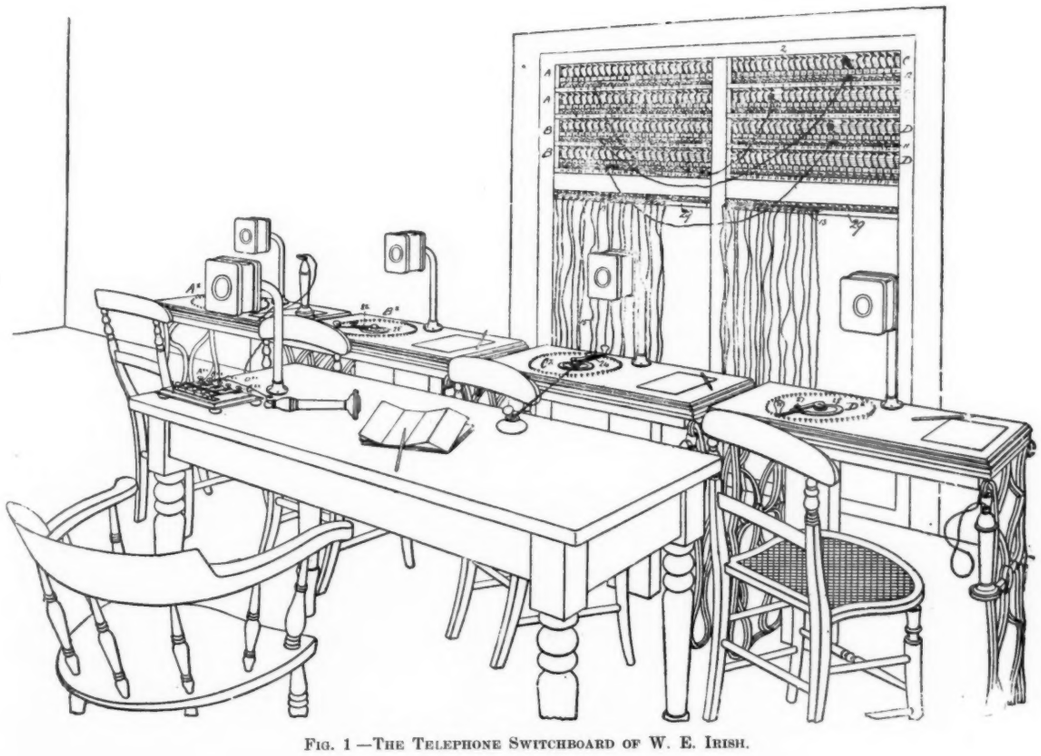

FIG. 1.—THE TELEPHONE SWITCHBOARD OF W. E. IRISH.

The Irish Quick-Switch for Telephone Central Offices.

This switchboard was specially designed to facilitate the connecting or switching of wires of subscribers to telephone or telegraph exchanges, and for the better working and supervision of the same. The illustration, Fig. 1, represents an exchange equipped with four commutators each for fifty subscribers, in all 200, but capable of accommodating 500 subscribers. The annunciators and slipper ways are mounted in rows of twenty-five, each on shelves, which are made to slide freely in and out of the frame from the back, where they can readily be examined, etc., at all times, without in any way interfering with the operators or switchroom. The commutators, which are of a novel construction, are built on the operator's table, and consist generally of a series of fifty studs, each numbered in accordance with the subscriber's line and the annunciator with which it is connected. Centrally in the ring of studs is placed a freely turning arm, which can be revolved about the center and over the studs. The commutator arm is divided in its center, the two halves being joined but insulated from each other, and electrically bridged by the calling key. On receipt of a call, the operator, to reply, turns the commutator arm to the stud bearing the caller's number, and by one movement depresses it and the calling key on to the stud and inner ring, thereby putting his battery to line and answering the call where and when necessary. On releasing the calling key, still keeping the arm depressed on the stud, the operator communicates with the subscriber, and having ascertained his requirements, he simply turns the arm to the stud in connection with the subscriber's line asked for, and repeats the operation. The subscribers are then connected by means of a cord and special jack, one annunciator only being left in the circuit for calling off. Any subscriber can be attended to by any operator from any commutator in the room.

The chief operator, by means of a simple keyboard, can place himself in circuit with

any operator and subscriber, without their knowledge, the advantage of which must be obvious.

Fig. 2 shows the electrical connections of commutator *A* through an annunciator, as well as the chief operator's keyboard.

Ozone.

By P. H. Vander Weyde.

[Prepared expressly for the Electrical Review.—Continued from June 19.]

After having given the most prominent data about the first discovery of ozone, and the theories in regard to its nature, the next thing in order is to describe the various methods of its preparation, and the means of detecting its presence.

Quite a number of devices, all intended for the production of ozone, are at present known. Each of these has its peculiar advantages and disadvantages, which may make either of them available or unsuitable for the special purposes for which the ozone is intended. The principal of these devices are:

1. Collecting the oxygen as it is developed under certain conditions when water is decomposed by a galvanic battery.

2. By passing air or oxygen through a tube, so arranged that the discharges of static electricity can be made to pass also and electrify this air.

3. By enclosing an electric arc light in a globe, through which air is conducted.

4. By passing the continuous discharges of an induction coil along a tube, through which air or oxygen is conducted.

5. By using sticks of phosphorus partially immersed in a bottle with water.

6. By the chemical reaction of certain substances, which, under certain conditions, will set oxygen free in the form of ozone.

7. By blowing air in a peculiar way through the flame of a Bunsen burner.

8. By decomposing water by the powerful current of a dynamo, with or without the intervention of secondary batteries.

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1. The first method is that originally used by Schoenbein, and was disposed of by the old description found in the article published June 19.

2. The action of static electricity upon oxygen and atmospheric air was first noticed by Van Marum, in Haarlem, in 1785. He found that oxygen treated in this way obtained the property to oxidize metals, especially mercury, at the ordinary temperature The special odor observed he stated to be "evidently the odor of the electric fluid.' No further investigations were made in this important subject for more than fifty years, when Schoenbein took the matter up, as stated before.

The improvements made in late years in regard to machines producing static electricity such as the Holtz machine, and others, in which friction is superseded by inductive action, has resulted in the construction of electric machines for the special purpose of producing ozone. Such a machine has been patented by Mr. Henry D. Hall, of New York. It consists of a Holtz machine, enclosed in a glass case to protect it against dust, and especially against moist air, which is fatal to experiments in static electricity. Under the base of the machine is a box, through which air is blown by means of a fan wheel; through this air the electricity is discharged from points, not as sparks, but as brush-like streams, it having been proved by Andrews and Tait that in this way pure ozone is formed, while the discharge of sparks may cause part of the ozone to combine with the nitrogen of the air and form nitrous acid, which is very undesirable, especially when the ozone is to be used for medical or sanitary ends, which is the special purpose of Mr. Hall's arrangement. It will transform into ozone 12 per cent. of the oxygen present, and as the latter is 20 per cent., or one-fifth of the atmosphere, it will produce an amount of ozone equal to about 2½ per cent. of the amount of air. Small as this amount seems, it is very large for medical purposes, as has been proved at the time that the medical profession began to introduce ozone when various cases occurred that patients suffered from an overdose. As ozone promises to become of the utmost importance, also as a disinfectant, many physicians have devoted considerable attention to it.

3 An electric arc light will also produce ozone, which I found to be easily proved at localities where electric lamps are frequently being tested. For instance, at stations where many dynamos are running for the illumination of cities and towns. This ozone is found to be largely contaminated with carbonic acid from the carbons, and with nitrous acid. In damp weather also with nitrate of ammonia; at such times the same reactions take place as in thunder clouds, where the electric discharge decomposing the watery vapor causes part of its hydrogen to combine with the atmospheric nitrogen, and form ammonia, while part of its oxygen also, combining with nitrogen, forms nitrous acid, which two compounds must necessarily combine into nitrate of ammonia. Parties employed in testing electric lamps experience a soreness of the eyes, which is not caused by the intensity of the light, as dark colored glasses offer no protection against this; the nitrous gases developed around the arc light, in addition to the ozone, are the chief cause of the trouble.

4. A Ruhmkorf induction coil may be made to produce an apparently continuous secondary current, which, however, consists in a rapid succession of alternately reversing discharges, generated in its fine wire, by the makes and breaks in the heavy primary wire, conducting the battery current. It was in 1860 that in the Cooper Institute, New York, I experimented largely on the problem of the production of ozone by the action of the induction coil, and I found the best arrangement to be that suggested by Siemens, who formed a sort of Leyden jar, by coating the interior of a glass tube with tin foil, and passed over this a second wider tube, coated also with tin foil, but at its outer surface; the two tin foil coverings were insulated and each connected with the end of the secondary wire of the induction coil. Between the two tubes a current of air or oxygen was passed, which by the inductive action of the alternate charges through the terminals of the coil, became subject to intense electrical excitement. By this means part of the oxygen passing between the two tubes became changed into ozone. Siemens claimed that when passing pure oxygen slowly through the apparatus from 10 to 15 per cent. of the same was changed into ozone.

My results, however, were not so favorable, and did by no means answer the expectations, as they were inferior to what had been done by the static glass disk machines. However, I do not wish to pretend that no better results would be attainable, when more experiments lead to further improvements in this method When the inner tube was omitted and the air passed with the electric discharges through the same tube, the ozone was largely contaminated with nitrous acid vapors, which is probably due to the fact that an induction coil does not give the steady brush-like discharges of a static machine, but that its current is more like a torrent of explosive discharges, which are very apt to cause the undesirable combination (above referred to) of the ozone with the atmospheric nitrogen.

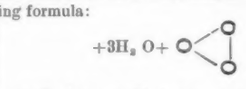
5. Schoenbein discovered in 1842 that when sticks of phosphorus were partially immersed in water, ozone was developed. In order to put this in practical application he recommended to leave the air in a flask for several hours in contact with pieces of phosphorus, about half way immersed in water, also contained in the flask. This method was soon modified by causing a slow current of air to pass through the flask, and David of Paris improved upon it by passing the air first over acetic acid, before submitting it to the influence of the phosphorus and water. The objection to this phosphorus process is, firstly, that it is very slow in its operation; the quantities obtained are very small, they are to be sure large enough to spread the ozone odor, and answer to the ordinary tests, and maybe do some disinfecting service; but when the question is to produce ozone in quantity for manufacturing purposes, the method is inadequate, hence that in cases when it has been attempted to use ozone for bleaching purposes, this method of production falls to give satisfaction, and ozone bleaching was soon abandoned.

A second objection is the impurity of the product. The ozone thus generated is contaminated with vapors of phosphorus *P*, hypophosphorous acid, $P_2 O_1$, phosphorous acid $P_2 O_3$, etc., not to speak of similar compounds of nitrogen and oxygen, which perhaps may be formed by the intervention of phosphorous, which chemically is closely related to nitrogen; the worst of the matter is that ozone thus prepared is used in the sick room for disinfecting or sanitary purposes; the contaminating acid exert a very irritating influence upon the respiratory organs, hence that some physicians have condemned its use, not knowing the existence of the contaminrting acids, the cause of the serious error being that these latter compounds act upon the test papers used for the detection of ozone in the sameway as does the ozone itself. To this must be added the fact that the odor of ozone happens to be similar to that of phosphorous, all of which is very apt to mislead us in our conclusions.

A very convenient way to experiment in this line is to use common phosphorus matches, tie them up into bunches and place them vertically in a dish so far filled with water that the tops of the matches, provided with the phosphorus compound, reach above the water, which then by capillary attraction will ascend and keep the tips moist. This method is in all respects equivalent to the use of the sticks of phosphorus, which often cannot be so easily and cheaply provided as is the case with matches.

It is also worth noticing that the ozone as developed by static electricity, in any way similar to that of Mr. Hall referred to above, does not exert the irritating influences upon the lungs referred to, for the simple reason that it is purer, and not contaminated with foreign ingredients.

6. Houseau discovered the method to develop ozone by the action of concentrated sulphuric acid upon barium bioxid. The reaction depends upon the strong affinity of the sulphuric acid for the barium, by which the latter is compelled to give up much of its oxygen. That it may do this in the form of ozone is illustrated in the following formula:



$$3\,(Ba\,O_2) + 3\,(H_2\,S\,O_4) = 3\,(Ba\,S\,O_4)$$

Barium bioxid. Sulphuric acid. Heavy spar.

Water. Ozone.

It may be remarked here that bioxid of barium is also used to prepare the remarkable compound of bioxid of hydrogen or superoxygenated water, which like ozone possesses powerful bleaching properties, so much so that it has become an article of trade and is used to change dark colored hair into light colored, in fact to transform brunettes into blondes. There is no doubt that the excess of oxygen in this compound is also in the condition of ozone.

Boetger who, in 1863, investigated the reaction of the permanganate salts, found that when dry pulverized permanganate of potash, 2 parts, is mixed with 3 parts of strong sulphuric acid a mixture is obtained, which, when placed in a glass stoppered bottle, will by gradual reaction produce ozone during many weeks, whence he called such a bottle "a new perpetual ozone generator," and showed how this ozone manifested the most intense oxidizing qualities, while the mixture itself, when brought in contact with any of the ethereal oils, will cause either an instantaneous combustion or a violent explosion.

David, in Paris, obtained in 1875 a patent in England for the production of ozone by means of permanganate of lime and sulphuric acid, in which the reaction as well as that of the former process may be explained in the same way as that of the bioxid of barium, the permanganates being as well rich in oxygen, loosely combined, as is the case with the bioxid of barium.

Still another method by the same was to mix pulverized chalk with a saturated solution of alum, and then add sulphuric acid; here the reaction is more complex.

7. Dr. Loew, formerly assistant in the laboratory of Professor Ogden Doremus in New York, patented in 1873 a process for the production of ozone on a large scale for manufacturing purposes. It was based on the observation that, when cold air is blown into the flame of a Bunsen burner, it will partially become charged with ozone. He places a number of such burners in a row, and a blowpipe jet at a certain small distance before each, with a funnel at the other side. to collect the ozone produced. It is easily found, however, that the ozone thus generated is always largely contaminated with nitrous acid and acetylen. R. Wagner is of opinion that no ozone at all is generated in this way, but only the various oxidation products of nitrogen.

It is the same with the so-called ozone water of Krebs, Kroll & Co. in Berlin, so largely advertised a few years ago. Behrens, of Kiel, proved that it contained no ozone at all, but consisted only of a diluted solution of hypochloric acid in water.*

8. It was four years ago (1882) that I made a series of experiments for the production of ozone on a large scale by passing the powerful and comparatively cheap current of a dynamo through acidulated water, and so decomposing it into ozonized oxygen, and, as a by product, hydrogen, which was utilized as fuel. The water, in order to secure its conductivity, was acidulated with a sufficient quantity of sulphuric acid, which being not volatile, like nitric acid, is not apt to contaminate the escaping gases; also for reason that already Schœnbein had demonstrated that sulphuric acid was especially favorable for the purpose. The electrode from which the oxygen was evolved consisted in a large platinum plate, while the other, from which the hydrogen evolved, was only copper. Each electrode was placed under a separate tubulated bell jar, in which the gas was collected, and conducted by rubber tubes to separate receptacles.

The result of the experiment was favorable in regard to the quality of the product, but by no means in regard to its cost, which was very high. It might have been anticipated, *a priori*, that such a method of production must necessarily be far more expensive than such methods in which the atmospheric oxygen is converted into ozone. The following considerations and calculations will explain this, and I trust that the importance of the subject will be considered a sufficient excuse for the following details:

The electric energy required to separate the component parts of water have been demonstrated to be equal to the caloric energy given out by the combustion of the hydrogen when it unites with the oxygen to form water. The latter amounts to 34,000 units of heat,† which means that every pound of hydrogen, in its combination with the necessary eight pounds of oxygen, develops this amount of heat.

As one cubic foot of oxygen weighs very near one-tenth of a pound, it follows that its combustion with hydrogen develops 5400 units of heat, of which the mechanical energy is equal to 5400 × 760 foot-pounds, or 4,104,000 foot-pounds; if developed every minute it is equivalent to 124 horse-power.

In order now to separate the elements (hydrogen and oxygen), of which the combination evolved an amount of heat equivalent to this mechanical energy, an amount of electricity has to be procured and consumed also equivalent to a mechanical energy of 124 horse-power, which then will evolve one cubic foot of ozone per minute—namely, under the supposition that there is no loss in this transformation. If the loss were equal to that experienced when the heat of coal is transformed into motive-power by the intervention of the steam engine, the loss would be 90 per cent, and the production of a cubic foot of ozone per minute would require 1,240 horse-power in place of 124. Fortunately, it has been proved that in the transformation of electricity into other forms of energy the losses are far less, and where power is abundant and of no account, as is sometimes the case where water-power is employed, this method of producing ozone may be available.

The methods to test the presence of ozone are chiefly based upon its strong oxidizing properties, and will be the subject of the next paper.

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* *Dingler's Journal*, CCVIII., page 73.

† A unit of heat is the amount required to heat one pound of water 1° Fahr., or, rather, from 32° to 33°.

Notes From Our Chautauqua Correspondent.

Editors Electrical Review:

This season will be unusually successful for Chautauqua. The lake is said to be, with one exception, the highest navigable water in the world. However the air is cool and bracing. The grounds and buildings in the evening are lighted by 2,000 candle-power Brush arc lamps, 19 lamps being used. The dynamo is over six years old, originally a 16 lighter, but now provided with the improved armature. The machine has been used winters at Akron, O., in general city lighting. The motive power is a plain slide valve engine with throttle valve governor. The lights are very steady, although the lamps are of the oldest pattern. To insure the steadiness of the power an auxiliary fly-wheel, weighing two tons, was put on the main shaft of the engine. The success in this instance shows conclusively how many small slide-valve engines could be made to do excellent work in electric lighting.

While present recently at an evening entertainment where pictures were shown by the lime-light lantern, the inconvenience caused by the management of the gas tanks and lantern was such as to lead one to wonder if nothing better for the purpose could be devised. In the lantern exhibitions for advertising purposes in many large cities an arc light is now almost always used. It gives a number of times more light, is easier to handle, and costs about 70 cents per evening, while a lime light would cost six times as much.

He had been a lightning-rod man, and a thunder tip man, and dignified himself with the title of electrician. In days gone by he had solved the question of perpetual motion and he yearned for more worlds to conquer. His latest invention was a rod-oil for arc lamps "anti-hyss" by name. The combination made and duly labeled, he started on a tour to introduce his invention. Entering a drug store where the s-s-s-s could be heard a block away, he thus, with suppliant hands, addressed the proprietor: "I have here a diamagnetic antiphlogistic lubricative hydrocarbon, whtch if applied to the rod of your arc lamp would annihilate the sibilant acoustically appreciated by the ear vibrations of the carbons." With an eye like senna and salts the worthy apotheke replied: "Don't want to stop the noise, it draws custom; besides," as he cast a sidelong glance at the oil man, "it isn't the arc that makes it, it's that stream of water in the glass case over the soda fountain." The oil man retired, and the double toed cat stretched herself and smiled encouragingly at the canary in the store window.

The field for steam engines will never be lessened by any development of the water power of the country. There are, however many places where water privileges can be employed to advantage for electric lighting and the electric transmission of power. There have been a number of failures in the use for water wheels for electric lighting purposes. There is perhaps no kind of apparatus which shows so quickly and to such a degree any variation in the motive power. It is easy to look at a fall and say that it is good for 100 horse-power, and if developed only one-half as much it still may drive machinery satisfactorily. Furthermore a lessening of speed one-half decreases the product one-half. But a decrease of speed when driving dynamos of 15 per cent. may put a whole or a part of the lights completely out. There is not a single case recorded of unsatisfactory work when a wheel of suitable type has been used and has not been overloaded.

INDUCTION.

The attention of the Dominion of Canada is called to the fact that no duty is paid on the electric current from the U S. which lights the arc lamps on the Canada side at Niagara Falls. We advise the brave revenue office on the Canada side to be provided with anti-lightning gloves when they try to seize the contraband current, as no reparation will be made in case of trouble. * * * * The wonderful endurance of the Niagara Falls hackmen is accounted for by the fact that a short stay on Luna Island imparts a deal of electricity to the system. It is rumored that in view of this fact hackmen and escaped orators will be kept out of this spot. * * * * Some hotels should obtain an electrical machine and work the ozone racket. * * * * The Lockport, N. Y., Gas Company furnishing gas, arc lights, incandescent street lamps in series, incandescent lamps in parallel for store and house lighting are bound to have all there is. * * * * It is said by a few a little more conservative than the rest that electricity can never be used over longer lines than five miles. There is now a continuous line of horse railroad from Boston to Beverly, Mass., and by proper extension to Gloucester, the introduction of electricity on these roads would give an electric railroad nearly 25 miles long—see—"look out for the engine when the bell rings." * * * * One of the greatest inducements of a summer resort is a good system of arc lighting for avenues and grounds. There is room for improvement in the substitution of the incandescent light for the miserable gasoline and kerosene.

Chautauqua, N. Y., July 18, 1886.

—— Within a few days the site will be chosen for the erection of the electric light station for the new incandescent company in the south side, Pittsburgh. The officers of the company are as follows: President, Theodore Ortman; directors, Messrs. J. W. Patterson, C. Campbell, of Jones & Co., Sam P. Connor, Theo. Ortman, and others.

Cooking by Electricity—A Hint to the Steward of The Electric Club.

The roaring of the thunder was terrific in East New York Sunday night, and the lightning furnished a pyrotechnic display that was both dazzling and dangerous. The flashes were incessant. A torch was applied to George T. Stewart's henhouse in Pennsylvania avenue, and 300 choice tender spring chickens were roasted as brown as a berry. Three horses were also cooked.—*New York Tribune.*

This is a decided advance on the Chinese method of cooking roast pig, by burning the sty, as certified to by Charles Lamb.

Industrial Electricity.

The days of "spinning" tin, copper, and other metals, would seem to be numbered. By the aid of the dynamo articles "grow." Whatever article or vessel may be wanted, a pattern or form is made of wood or some other suitable material, this form is covered with refined wax, paraffine, or similar substance. This surface is rendered conductive with the well-known electrotyper's process, by the application of plumbago; it is then immersed in a copper solution and connected electrically with a dynamo, and the growth of the vessel begins. Thickness is determined by the length of time deposit is allowed to continue, and the time required to complete a vessel of a certain weight depends upon the size of the dynamo. The Brush Company, of Cleveland, are now building one that will deposit 315 pounds of copper per hour. The weight of locomotive reflectors will average 14 pounds; 225 reflectors can be made in 10 hours.

Electricity is surely taking the lead in valuable inventions and this promises to do away with much time and labor, and will also introduce some new and important articles upon the market. The greatest revolution which this process bids fair to bring about will be in the plumbing goods line. To make a bath tub, instead of cutting sheets of copper to exact dimensions, and then soldering them together, an entire shell will be made in one single piece and a far better and cheaper article will be the result.

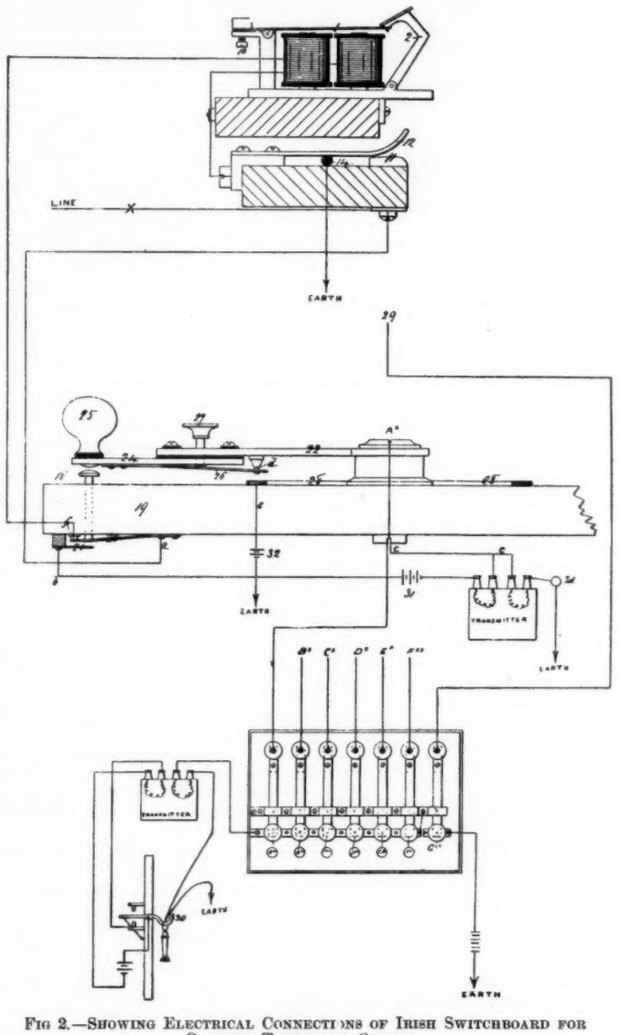

FIG 2.—SHOWING ELECTRICAL CONNECTIONS OF IRISH SWITCHBOARD FOR CENTRAL TELEPHONE OFFICES.

Damascening by Electrolysis.

A method of damascening metals by electrolysis has been brought out in France. Two copper plates are put into a bath of sulphate of copper solution, one being connected with the positive pole and the other with the negative pole of a battery. A thin layer of insulating varnish or wax is spread over one of the copper plates, viz., that connected to the positive pole, and the damascened device is etched on it. Now, since copper is by electrolysis transferred from this plate to the other plate, it follows that only the lines of the drawing can be attacked. A battery of two cells is sufficient for this purpose. When the plate has been bitten to the depth of 1 mm. it is removed from the bath and treated with hydrochloric acid to remove traces of oxide of copper in the lines of the drawing. It is then washed with water and suspended in a bath of nickel and silver and connected with the negative pole of the battery. The positive pole now consists of a plate of platinum. The silver or nickel deposits wherever the copper has been attacked, and the depressions are soon filled with foreign metal. The plate is then polished, and looks like one which has been damascened by hand.

Fusible Alloys.

No. 1.—Alloy Fusing at 94° C.

Lead	5 parts.
Tin	3 "
Bismuth	8 "

No. 2.—Alloy Fusing at 66° C.

Lead	2 parts.
Tin	4 "
Bismuth	7 to 8 "
Cadmium	1 to 2 "

No. 3.—Alloy Fusing at 53° C.

No. 1 alloy	9 parts
Mercury	1 part.

A New Method of Making Carbons for Incandescent Lamps.

A method for this purpose devised by Mr. Alex. Bernstein consists in making a carbon filament entirely out of hard and dense carbon, which is obtained by the decomposition of a liquid or gaseous carbon compound, and without any filament to deposit on. In order to accomplish this, the inventor uses a vessel containing a carbon compound, which is decomposable by heat, and which compound may be in the form of a liquid or vapor. On the bottom of the vessel he places a conductor, say a piece of copper, which is connected with the negative pole of a suitable current generator. Then he suspends a wire, which is connected with the positive pole of the generator, in such a way that it may be made to touch the copper, and can be gradually and slowly withdrawn from it by suitable mechanism. As soon as the wire is withdrawn from the copper, an arc is formed between them, and as the greatest heat is at the end of the wire which forms the positive pole, a deposit of carbon takes place at the end of the wire. The deposit so formed shortens the arc; but if the wire is withdrawn at the same rate at which the deposit is formed, the result will be that a filament is gradually formed at the end of the wire, which filament consists entirely of a hard and dense carbon. The filament may be of any length, and the thickness of it can be varied by the varying speed given to the motion of the wire.

—— The stores, and some of the hotels of Saratoga have been lighted this season with the new and improved apparatus of the American Electric Manufacturing Company. Some 75 full arc lamps are now running, and between 300 and 400 incandescent lamps are now being added. some of them on the streets and piazzas of the hotels, and many in stores.

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The *American Electrical Directory*, published by the Star Iron Tower Company, of Fort Wayne, Ind., has just been issued, and is a very complete publication. There are a number of new and interesting features in it, and the publishers have evidently endeavored to make the edition this year the most valuable work of the kind ever published, and we think they have succeeded. An excellent picture of the president of the National Electric Light Association appears.

SCENE I.—There is no disputing figures, sir. They don't lie. You see, sir, that with our system of electric elevated railroads we can pay a dividend of at least 250 per cent. (Sir invests his hard-earned cash.)

SCENE II.—(Four years supposed to have elapsed.)—Dividends? No, sir; not yet, sir; be patient, sir. Our inventor says that we will be running in a few days. You see the Foucault lavator labaiè alegue nasè of the dynamo needs adjusting, and when we get that right, sir, then, sir, prepare for wealth—wealth, sir. (Exeunt omnes.)

The electrician who would not lose caste these days must be the inventor of a storage battery, or an underground electric wire system.

What's the trouble? Is it not about time for a new crop of primary batteries? Something, you know, that is going to revolutionize the world, etc. Seems to be a slight lull.

Systems of electric lighting, based upon the use of secondary transformers, are beginning to loom up. Such information as we have been able to obtain indicates very satisfactory results.

A great many replies have been received in response to the circular relating to mutual insurance of electric light companies, published in our last. There will, it is now thought, be a sufficient number to justify the signers of the circular to decide on a line of action.

Congressman Hanback, of Kansas, who in one day became famous by introducing the resolution of inquiry into the Pan-Electric telephone scandal, has been defeated in convention in his candidacy for renomination. His defeat was not caused by this resolution, however, but by the fact that on about the one hundredth ballot his opponents united on another man.

There is a particularly good outlook for the electric lighting business during the balance of this season. There are a great many wide-awake and zealous young men in this field, well backed by strong companies, and they are pushing their various systems to the front with an energy and tact that bodes well for the advance of electric lighting. We wish them all success.

The United States Patent Office is well worthy of a visit to any one who may happen to be in Washington. There you will find much to interest you. The patent examiners are courteous gentlemen, and the examinesses are—are—well, just too lovely for anything. We recently had occasion to visit the Patent Office, and we came away satisfied as to why it took six months for an application to be considered. For our part we honestly confess that if we had such lovely surroundings, no patent application would stand any show at all. Oh!—we—want—to—be—a—patent—examiner.

It is gratifying to know that amid the excitement occasioned by telephonic litigation there is now and then a community that, having warmed up to the fighting point, have allowed discretion to predominate in their valor, and the olive branch to take the place of the war paint. Among others, the people of Chattanooga, Tenn., have allowed good judgment and kind feeling to overcome an angry prejudice, when the facts were presented to them, and the telephone companies operating in that city are deserving of no little credit for the open manner in which the opposition was met. Their willingness to give all needed facts and figures and their courteous treatment of their subscribers who were acting under erroneous impressions, were most commendable. Such companies and such communities have our hearty congratulations.

The Mayor of Kansas City, it is said, will soon send in a communication to the city council asking the aldermen to pass an ordinance compelling telegraph and telephone companies to put their wires under ground instead of stringing them on poles. The movement has never been inaugurated there, although discussed more or less for two or three years. There is probably no city less ready for such expensive and necessarily permanent work. Kansas City with its unpaved, ungraded, and, in many places, unknown streets, is not a very desirable city for underground experiments. It would work a sad injustice to the telephone company, which has just expended nearly $100,000 in the finest aerial construction to be seen in any city; and the telegraph companies also have recently made considerable additions to their plants.

ELECTRICITY THE WANTING FACTOR.

Aside from the application of electricity to designs altogether novel, and in which the electric current is the main reliance, the careful observer will scarcely fail to remark the wonderful interposition of electricity to perfect contrivances long since thought out. Instances of this are to be found in the submarine torpedo-boat, the new phenomenon in naval architecture, the "Eureka" and the new fire-damp indicator for mines. The submarine torpedo-boat, like that of Nordenfeldt, was possible with the steam-engine, but not practicable. The vital properties of the atmosphere within were soon exhausted, when the sub-current was reached. But the secondary battery supplied power with a minimum of heat and no smoke, and light without combustion. The principle on which the Secor boat is constructed is the explosion of petroleum underneath the keel; but the principle was of little value until electricity stepped in and supplied an easily controllable spark. All sorts of contrivances have been thought out, to protect the miner from the fatal effects of fire-damp, but until the coming of an electrical mechanism without avail. The present apparatus, and the only one yet found which will accomplish its mission effectually, was recently described before the Physical Society of London. "It consists," we are told, "of two incandescent lamps, one with colorless, the other with red glass. The circuit is so arranged that, in an ordinary atmosphere, the colorless lamp alone shines, but in fire-damp this goes out and the red one is illuminated. This is effected in a simple manner by the motion of a mercury contact occupying the lower part of a curved tube, one end of which is open, and the other connected with a porous pot of unglazed porcelain, the motion of the mercury being due to the increased pressure in the porous pot, occasioned by diffusion.

HOW TO STUDY ELECTRICITY.

Faraday once remarked "that he never could understand an experiment until he had seen it."

The moral which we wish to draw from this is, that beginners, students of the science of electricity, should learn to verify any statements that they may see in print, in text-books, or elsewhere, by practical experiment. The apparatus necessary to study the principal facts of either static or dynamic electricity will cost but very little—a few dollars at the most—and more valuable and practical information can be acquired in one evening of experimentation than in a month of the most careful and conscientious reading. What you read may appear very simple and easy of comprehension, and you may not see the necessity of personally repeating the described experiment—not so. Take the time to make the trial, and it will amply repay you. Very few beginners have any skill at arranging apparatus, and hence in nine cases out of ten they will fail in their first efforts at verification. The very failures serve a good purpose. Try again, and every time you make a failure you will learn something. When you do succeed you will have learned a lesson which you never can forget.

There are very few text-writers who can bring themselves down to the level of their readers. They are too apt to assume that that which is plain to them should be patent to every one. As a consequence they leave entirely too much to be inferred, and their statements are often incomprehensible to all but those skilled in the science. Further, we would say, do not be deterred because of unfamiliarity with mathematics, or because you do not understand formula. Some of the greatest discoverers have been men who knew little or nothing of these matters—all of their work was the result of reasonable deduction from experiment.

Conscientious experiment and good common sense will go a very long way toward teaching all that is worth knowing.

We are often in the receipt of letters asking what books to buy, and how to go to work to study electricity. To such it is our invariable rule to answer, obtain the simplest text book you can find, such, for instance, as Sylvanus Thompson's Elementary Lessons in Electricity—read it carefully and repeat every described experiment, not once but a dozen times. Spend at least a year on this book alone. Stick to it. Do not throw it down at the end of a week and imagine you know all there is to be learned. The writer well remembers his introduction to the late Professor Agassiz, and how he learned his method of investigation.

Having undertaken the study of natural history, I went to the professor and asked him where to begin. "Ah," said he, "so you want to begin, do you? All right, here is a blue fish, now take it, dissect it carefully, note all you see, and come back to-morrow at the same time and report." Off I started with my fish. Very carefully I went about my dissection. In an hour or two I fancied I knew all about that fish, but as I was not to report until the next day I kept at it, every hour finding something new. I went to the professor at the appointed time, feeling proud and confident that my natural discernment, for such I was pleased to term it, had enabled me to master the subject, and that I should well acquit myself in my report. The professor listened to all I had to say, and in his quiet way remarked, "So, so, very good, but not all." To make a long story short I kept at that fish for a month, always the same answer, "very good, but not all." How I hated that fish at the end of the first week. How it did stink! I did not want to touch it, and flew into a rage at least a dozen times, and yet each day I found something new, and so on until the end of the month, and what there was then about that fish that I did not know was not worth knowing.

Such was Agassiz's system. Apply it to the simplest experiment in electricity and you will be more than surprised at the wide field that will display itself before your vision. From one fact you will be led to deduce others. You will find your interest grow day by day. Probably you will reach some conclusion that you will not find reported, and to you a new fact; but do not become proud and imagine yourself a great discoverer. Great discoverers do not grow on every huckleberry bush, and you will, in all probability, only be re-discovering something already well known. Still keep on. Little by little you will learn, learn what you cannot by any other means. Further make notes, and try and commit your thoughts to paper. Ideas and thoughts often spring up in the mind which are irrevocably lost for want of noting at the time. Very often vague, ill-defined ideas will take definite shape when written out. When you can do this readily you will have acquired the power of benefiting others besides yourself, and chance may lead you to discoveries which will be of benefit to mankind, and honor and profit to yourself.

CHICAGO ELECTRICAL NEWS.

The storm king is still on his summer tour. Lakin, Kansas, west of Garden City about twenty-two miles, received a call on the evening of the 18th instant. Twenty houses were demolished, and a dozen persons more or less injured, but none fatally. The storm was a decided hurricane.

At Nickerson, near Topeka, the heavy wind blew down eighteen buildings. Over about two-thirds of the State what the farmers denominate a "corn salvation" rain fell.

Minden, Neb., caught it also. The wind and lightning were reported very destructive to lives and property. Near Fredericksburg a Danish church was blown down, killing a Mrs. Monks, and severely injuring several others. Nine miles south of Minden, lightning struck a sod house, killing a German farmer and two of his children, while a third child was paralyzed by the stroke.

But there is a brighter side to the picture. At Red Lake reservation, near St. Hilaire, Minn., the storm did nobly. Five Indians were killed, and ten more winged or otherwise wounded. It is thought that perhaps some of this lot will also become good In-

dians. A settler and his wife on Thief River were also killed by lightning.

Down in New Mexico the other day, a hail storm in the Pecos Valley is reported to have killed 2,000 sheep, the property of one man.

While on the subject of storms, somebody down in Georgia tells of a storm which he witnessed once, where a negro was out fishing. The storm came, scooped up the earth forty feet wide and ten feet deep, struck the river, lifted the darkey, boat and all, and the river with it, carried the whole fifty miles, and set all down together, and left the nigger still fishing. "It scared him so, he turned white", said the gentleman; "if you don't believe it, look at me."

The accession to the managing editorship of a prominent Indianapolis daily, a short time since, by a young Chicago editor, brings up the common thought, what trivial incidents may sometimes change the tenor of one's way the whole bent of a life.

Years ago, in a Kentucky city, a young man fresh from school came to the writer and asked his advice as to the propriety of taking up telegraphy as a business, referring to the "Telegraph College" a few blocks away, where young folks were taught the science in a few days or weeks, and guaranteed situations at good paying rates—the old brass-mounted style of "Catch 'em, fleece 'em fire 'em," a style in vogue among telegraph colleges everywhere.

To grasp as much of the situation as possible it was decided to interview the professor superintendent of telegraphy in the operating room of the institution, and thither we went.

The professor was found, and, as a preliminary, he was made to avow himself the electrical superintendent of the class. The class was one youth who looked, poor thing, as if his proper sphere were the knife scouring and floor scrubbing department of a shabby genteel boarding house.

The professor explained that most of the class were either just graduated or were on vacations.

He was asked many questions on electrical science, to which he gave fearful and wonderful replies. In answer to the possibility of sending two currents on one wire at the same time, the learned pundit showed conclusively, to himself at least, that the very idea was preposterous, and when the questioner ventured to assert that somewhere he thought he had heard of some sort of machine by which four messages could be sent over a wire simultaneously, he denounced the writer of such a statement as a Munchausen of the purest water.

He said one might as well claim that the telegraph was capable of printing, or of sending *fac-similes* of manuscript.

The result was as hoped. The youth did not learn telegraphy, with a possibility of pounding brass for life, perhaps assistant manager at some cross road town in Kentucky, but went into journalism, and at thirty-two years of age finds himself, as he says, "at the summit of my ambition." And the best wishes of all his old time friends follow him.

The American Bell Company has a little misunderstanding with the Inter-State Telephone Company in the United States Circuit Court here.

On the 22d instant, the defendant, Jno. C. Gault, Joseph Reynolds and others, filed a lengthy answer in the case. Defendants claim that Bell's patent of March 7, 1876, was for an improvement in the art of telegraphy, but deny that the patent related in any way to the art of telephony. The patent nowhere suggested the idea of the transmission of articulate speech, either telegraphically or otherwise. Bell only intimated that the armature which was intended to put the electric current into undulations, according to his theory, could be vibrated by human voice or a musical instrument; that Gray had anticipated the invention, and filed his caveat, which Bell saw, and at once changed his own invention. Bell also had admitted that his own apparatus would not transmit articulate speech. Jan. 30, 1877, Bell obtained a patent for producing musical tones by undulatory currents of electricity, whereby a number of telegraphic signals can be sent simultaneously over the same wire, and in that patent he first claimed that his apparatus would transmit articulate speech. It is also denied that Bell created any new art or industry, and it is claimed that he was compelled to use the Blake transmitter, founded on the old Phillip Reis transmitter of 1863. The answer then goes on to give a history of the gigantic Bell monopoly and the means by which it was carried out, and the litigation begun by the Government, and fires a parting shot peroration, which denies the validity of the Bell patents, and assumes that defendant's instruments are not infringements, even if the patents were valid.

Again the story of the elderly dame and her kettle.

The American-Cushman Company, however, takes the bun. They hold evidence which knocks everything in the way of a telephone patent a stunning blow on the tenderest, thinnest portion of its cranium—deals a death blow to the wicked and unscrupulous monopoly, scattering the ashes to the four winds of heaven, leaving no track, trace nor resemblance, and all that sort of thing you know of the vile and perjured thing, or words to that effect.

The Common Council of Aurora have recently made a contract for a "fire and police alarm," and say they will soon be ready for business on that sort of work. And investigation has also been made under the direction of the City Fathers in the matter of electric lighting. The city now has 26 public lights, for which $8,500 per annum is paid.

The claim is made that for $13,000 the city can obtain a fifty horse-power boiler, engine, etc., two twenty-five light dynamos, and twenty miles of wire. The estimated running expenses are estimated for the fifty lights at $4,500 to $8,000 per annum. At the highest figure the city would gain twenty-four lights, and a saving of five hundred dollars. Somebody must have been enjoying a rather fat contract, or somebody must be anxions to work for fame and health.

The North American Telegraph Company which comes into Aurora *via* the C. B. & O. Railways, purposes opening an office there, and has asked right of way through the streets. The people are highly pleased at the prospect of competition and want a new express company as well. They say they have suffered from telegraph and express monopoly all they desire to, and they are not any too kindly inclined toward the telephone company.

CHICAGO, July 26, 1886.

Photometry.

A neat method of indicating the precise rate of consumption of candles, used in photometrical work, has been carried out in Germany. The candle holder is hung in an unequal arm balance, the beam of which has a long pointer hanging down from the fulcrum for marking the position of the balance on a vernier scale. At the two opposite ends of the scale there are two metallic pins, while a movable pin, in electrical connection with a battery and a bell is arranged in the middle of the scale. The candles are lighted and weighed until the pointer just swings clear of one stud of the vernier, when a certain weight is placed in a pan provided for the purpose underneath the candles, a clock being started at the same moment. When owing to the consumption of the candles, the weight placed in the pan is lifted by the weight in the opposite pan, the pointer swings back and touches the pin which completes the circuit and so rings the bell. By noting the time the candles were burning, the precise rate of consumption of the candles can be easily determined.

Utilizing Wind Power for Electric Lighting.

Editors Electrical Review:

Your article on the above subject moves me to say a word.

From the experience I have had with wind engines, I should not think them very well adapted to run a dynamo for the purpose of charging a storage battery. Their force is so intermittent and varying that an extremely simple apparatus would be necessary in the shape of a dynamo and attachments. True, the modern wind engine regulates to an almost constant speed in a storm, but when the regulator comes into play, the wheel is running at a dizzy speed, and sometimes disembodies itself in the effort to regulate.

Secondly, a very simple, and at the same time economical, means of storing power by the use of a wind engine, and a method that will readily commend itself to mechanics, is one in which the wind-wheel moves a belt on which are arranged carrying cups, by means of which fine sand is raised and stored in a bin at any convenient height. It will be seen the amount of power stored will be limited only by the quantity of sand a man possesses. It is evident, also, the same sand may be elevated an indefinite number of times after it has been used as a source of power.

The method of using it is to arrange a chute and fall which will direct a stream of sand from the bin or reservoir into an overshot wheel, this wheel being arranged to move a dynamo directly without any intermediary.

To my mind the above method would suggest itself as the more practical one, and one giving more reliable results than charging storage cells from the primary power.

One factor in the case I have omitted; the wind is a very unreliable and irresponsible agent. It may and does occur that for several days at a time no wind blows of sufficient power to move a well regulated wind engine, and if at all only a few revolutions.

In view of this fact a large reserve of power should be employed to meet such an emergency. Ten incandescent lamps of 16 candle-power are equal to an output of one and two-thirds of one horse-power nearly, in machines of ten candle-power capacity. That means eight to ten horse-power stored in twenty-four hours, and every day in the week. This is presupposing five hours' use per day.

The wind being a practically unknown factor it cannot be depended on for more than about six hours' hard work per day, possibly not half of this, so that a wind capacity of one and a-half to three horse-power should be supplied to be safe. Five horse-power would be better. I think the scheme would be practical if plenty of power is supplied to raise the sand. Twenty per cent. should be allowed for friction of machinery in raising the sand and in the friction of the overshot wheel and dynamo.

H. S. T.

NEW YORK, July 27, 1886.

Reduced Rates to the Electric Light Convention.

Chairman J F. Noonan, of the Committee on Transportation of the National Electric Light Association, makes the following announcement:

A. J. DE CAMP, ESQ., CHAIRMAN EXECUTIVE COMMITTEE NATIONAL ELECTRIC LIGHT ASSOCIATION.

Dear Sir:—I have an approved rate from New York to Suspension Bridge and return for member of the Electric Light Association of $13.90.

On account of the delay of the Western Traffic Association, I cannot give rate from Suspension Bridge to Detroit until next week.

In connection therewith the Wabash people will give a reduced rate from Detroit to St. Louis and return for such of our members as desire to attend the National Telephone Convention. Yours, respectfully,

J. F. NOONAN,
Chairman.

Paterson, N. J., July, 26, 1886.

Wrinkles — Electrical and Otherwise — Practical Information.

To tin small castings, clean and boil them with scraps of block-tin in a solution of cream of tartar.

According to Richards, for the extreme high speeds sometime necessary, belts of cotton webbing can be used with advantage. Heavy saddlers' webbing, coated with beeswax, makes a belt that is very light and has a high tractile power. When used the pulleys must be true and smooth, and the belts kept clear of flanges or anything which will produce a rubbing action, as this soon destroys them.

In putting a belt on a moving pulley it is well to remember that the whole secret of success lies in moving the hand as fast as the pulley goes. Large belts, unless very long, should never be thrown on while the pulleys are in motion, but drawn together with clamps and joined. If they have to be thrown on stop the pulleys, lash the belt to the face of the pulley, and turn by hand or slowly with the power, until the pulley has made a half turn and the belt is on, when the lashing can be removed.

To produce from a broken casting without the original pattern. Put the pieces of the broken casting together and mold them, and cast from this mold. When the casting is drawn from the sand place it in a charcoal fire and anneal it. It will expand to the original size of the pattern, and then remain in that expanded state.

Mercurial steam gauges can be kept clean by putting a little glycerine or sulphuric acid on the surface of the mercury. This serves as a lubricator for both glass and metals, and prevents their adhesion.

Lead in contact with steam, under a pressure of over 10 lbs. per square inch, very soon loses its strength, and it is therefore good neither for packing joints nor for conveying steam.

To make a cheap Leyden jar line a thin glass candy jar inside and outside with tinfoil, such as is used to wrap chewing tobacco in. Stick the foil on with mucilage, varnish or flour paste. A still cheaper plan is simply to fill a glass jar nearly full of water and place it within another vessel of water, so that the water, both outside and inside, shall be on the same level.

Accidents are common in large manufactories through the engagement of some portion of a workman's garments with a swiftly rotating shaft. A simple way of rendering these casualties impossible is to cover the shaft with a loose sleeve along its whole length. The sleeve may be of tin or zinc, and made so as to be removable if desired. The friction between it and the shaft would be sufficient to cause its rotation with the latter; but, of course, in event of a fabric becoming wrapped around it, it would quickly stop, and allow of the easy extrication of the same. The sleeve should be lined with leather both within and at the ends in order to prevent noise. The same idea, in the shape of loose covers, might readily be applied to cog-wheels or pulleys.

Glass being a very poor conductor of heat, hot water should never be poured into glass vessels unless tepid water has first been used, or a little cold water, on which to pour the hot. Lamp chimneys frequently crack when placed upon the lighted lamp, especially when taken from a cold room. Remedy: Turn up the flame gradually or by degrees.

If You Want Anything, Call a Messenger.

A Newark undertaker called a Domestic messenger one night last week, and a small boy answered the summons. An hour later he returned to the Domestic office, looking very white and sad.

"Where have you been?" asked the Superintendent.

"Settin' up with a corpse," said the dispirited youth.

Telephonic News

*** Telephone properties are generally looking up.

*** The Southern New England Telephone Company has declared a dividend of 1½ per cent. for the quarter ending June 30.

*** Long distance telephoning—"Hello Phila.! Give me Atlantic City." "O. K." "That you Clara?" "Yes Where are you?" "New York. How's baby; got that tooth yet?" "Yes." "Ta ta—all right, Central."

*** New England Telephone rose to 41½ last week. The advance in New England is attributed to the expectation that the quarterly dividend of the company, now due in a short time, will be increased from ¾ of 1 per cent. to 1 per cent. The earnings for the past three months, it is stated, will justify the increase.

*** Commissioner Mealey, of New Orleans, has addressed the following communication to J. J. Fowler, of the Great Southern Telephone and Telegraph Company: "I am directed by resolution of the City Council to notify you that your poles will be used gratuitously for the support of wires for operating the police patrol system, in conformity with Ordinance No. 519, section 4, adopted Dec. 27, 1883, as follows: Be it further ordained, etc., that in addition to the price paid per pole per annum, as herein set forth, the city shall have the right, under such regulations as may be established by the Council, to use said poles gratuitously for the support of such wires as may be found necessary for the service of the Fire Alarm and Police Departments."

*** When the telegraph lines are buried and the poles disappear from our streets, what will become of the familiar lineman, he of the strapped trousers and spurred boots? While the artist and the man of artistic instincts have been inveighing against the monstrous ugliness of these obstructions; while the house-owners have protested against the incidental use of their roofs and chimneys and the transformation of carpeted stairways into public thoroughfares; while even the small boy, with one eye on his stranded kite, has added his piping voice to the chorus of condemnation, has it ever occurred to any one to consider with what absorbed interest and attention the explorers of the pole must watch the doings of Mr. Flower and his associates? Do they know what will become of themselves, these arboreal men?

*** Secretary Barney, of the National Telephone Exchange Association, makes the following announcement: "To accommodate delegates from New York and the East, to the next annual meeting of this Association, which commences at St. Louis, on the 7th of September next, I have arranged for special cars from this city through, at the rate of $32 for the round trip, provided a sufficient number of tickets are sold. The Pullman sleeping car charge will be $6 each way additional. The train will leave by the Erie Railroad, foot of Chambers st., N. R., on Sunday September 5, at 6 P.M., arriving at St. Louis, on Tuesday, September 7, at 7.30 A.M. Should you desire to join the party, please notify me as soon as possible, and state the sleeping accommodations required. These will be allotted in the order in which applications are received."

*** There was to have been a consolidation of two of the Indianapolis telephone companies opposed to the Central Union Company, but it seems that a hitch has occurred in the negotiations. The two companies were the Citizens' Co-operative and the Wallace Telephone companies. The directors are understood to have expected that Mr. Wallace would present a satisfactory bond to insure the fulfillment of his agreement that the company will protect its licensees, defend them and their subscribers at its own cost, and prosecute any one who attempts to intimidate any person from using the Wallace telephone by parties of prosecution. A *Journal* reporter received an intimation that the directors asked Mr. Wallace to execute a bond signed by persons known to them, and that he flatly refused, saying that under the guarantee which he offered the Wallace company was responsible, and that it was backed by enough wealth to make all persons using the Wallace telephone perfectly safe. The directors were not satisfied with this, and Mr. Wallace is said to have left the room in no very pleasant frame of mind. With this information as a pointer, the reporter hunted up Mr. Wallace, and found him in a frame of mind. He said he was going to leave the city the next morning, and didn't know whether he should come back; that he would be blessed if he gave anything more than the guarantee which he had proposed; that one member of his company was a man worth $60,000,000, and another was worth $50,000,000, and that it was fully responsible. He intimated that he didn't propose to bother himself further about the matter. If the directors chose to go on and buy the instruments, he was ready to sell to them and protect them, but a bond he would not give.

*** The use of the magneto and polarized magnet and bells, for calling to the telephone, has had a tendency to increase the use of this form of apparatus. It is in many instances of great value to displace the use of batteries where there is liability of freezing, or where the labor of attendance upon batteries would be an inconvenience. Watchmen's electric detectors are now actuated by magnetos instead of batteries. When the watchman visits the station his act of inserting and turning a key winds a coiled spring, whose release turns the armature of a magneto, and the current produced actuates the recording apparatus at the clock in the mill office. Such records are absolutely beyond suspicion, as the operation cannot be duplicated in any other manner than by the magneto at the stations. An ingenious speed gauge consists of a small magneto with a galvanometer in the circuit; the dial of the galvanometer is graduated, so that the deflection will correspond to given speeds of the armature. The projecting end of the armature shaft terminates in a pyramidal point and will hold securely in the countersink at the end of a revolving shaft. Such speed gauges should be compared to a standard from time to time lest any variation in the saturation of the magnets will give results not in accord with the graduation of the galvanometer. Mr. Edward Weston made a somewhat different speed gauge, although electrical in its nature. It is based upon the discovery by Arago in 1824, that a needle is deflected by a revolving copper disk. In this case a copper disk is attached to a hand at a dial, and the bar is revolved parallel to the disk, the torsion of the disk on the shaft being resisted by a spring, and turning through an angle proportional to the velocity, which is thereby indicated on the dial.

The Deaf Telephone Ear in Troy, N. Y.

Collector—"Hello! Is that you, Mr. Jones?"

Mr. Jones—"Yes. Who are you?"

Collector—"Can you pay that bill of Dunn & Co. to-day?"

Mr. Jones—"I don't exactly catch that. Please speak louder. I'm a little deaf in one ear."

Collector—"I say, *Can you pay that bill?*" (Gets red in the face from yelling.)

Mr. Jones—"I can't understand."

Collector—"TRY THE OTHER EAR."

Mr. Jones—"Can't hear a word you say."

Slam! Bang! Collector expires.

One hour later:

Mr. Brown telephones to Mr. Jones, and speaks low so his partner can't hear him—"Is that you, Jones? Can you come up to the club this evening and have a bottle of champagne with me?"

Mr. Jones—Of course, I can; I'll be there, old boy."

The telephone ear is wonderfully made.

The Improvement in the Telephone System of Cincinnati.

"Captain George N. Stone, they tell me that the telephone company is going to do something unprecedented in electrical annals—consolidate three or four exchanges without interrupting business," said a reporter of the *Times-Star* of Cincinnati.

"Yes, that is the truth. It will be a delicate and interesting task, but I think it has been planned so that it will be carried through without a hitch. We expect to make the change in a single night."

Captain Stone went on to remark that the Bell Telephone Company here has the largest list of subscribers in their Cincinnati exchange of any city in the world, except New York and Chicago, and is credited with giving the best telephone service at the lowest rates rendered in any of the large cities. Notwithstanding this fact, this company never fails to give its subscribers the benefit of any and all new inventions and improvements that will in any way improve the service. As an evidence of this fact, a few months ago a device known as the Oram Time Repeater was invented, and the Cincinnati Telephone Company was the first to adopt it and connect it to all subscribers' lines. By this device the correct time is repeated every minute over each wire, which is a great convenience to subscribers and furnished without extra charge.

The company now propose to make great improvement. They have arranged to put in a new improved multiple switch board. For this purpose they have decided to rebuild that portion of their plant in the lower part of the city with 65 feet red cedar poles, and string a new copper wire for each subscriber, and consolidate all the subscribers now in the central exchange, Fourth and Walnut, the Public Landing and the Front and Elm street exchanges in one exchange. They have taken a twenty year lease on the Scottish Rite Rooms in the Masonic Temple, and entered into a contract with the Western Electric Co., of Chicago, agreeing to pay that company $21,500 for their latest improved multiple switchboard, with a capacity for 5,000 subscribers. With the improved multiple switchboard connections can be made between subscribers on an average of one every five seconds. Head telephones will be used by operators, and checks now used between operators in completing connections and check boys will be dispensed with.

This consolidation of exchanges, rebuilding pole lines, stringing copper wire, equipping the new exchange and taking down old poles and wire will cost the company about $80,000.

To make this change involves another burden on the company. Besides paying the Western Electric Company $21,500 for the multiple switchboard, they are required to enter into a contract to pay an annual royalty of $1 for each wire.

The room in which the new exchange will be located is reached by elevator on the fourth floor, and is 42x69, with a 30 feet ceiling, well lighted and ventilated. Connected with this large room there will be a ladies' toilet and parlor for the use of the lady operators.

The tower on the northeast corner of Third and Walnut streets will be fitted up and equipped for a cable house, with the latest and most improved cable fixtures, to consist of a cross connecting board, equipped with 6,000 binding posts. All wires will be conducted from the poles to the tower in cables of 100 wires each. Many of these cables will extend out several squares from the tower, intercepting and bringing in subscribers' wires from intersecting streets.

To guard against danger from fire, thermostats will be placed in the tower, and all rooms occupied by the telephone company, and attached by wire to an indicator placed in the exchange room, which indicator will, in case of fire, ring a bell and throw a drop, which will indicate to the man in charge the exact location of the danger. Three of the latest improved chemical extinguishers will be kept in the exchange room ready for use.

Capt. G. N. Stone desires to say that if he is missed during the progress of this work, he extends a cordial invitation to his friends to call on him at Longview Asylum.

Both Ears at the Telephone.

"It is a remarkable fact," remarks the Troy *Telegram*, "that a large number of persons in this city are becoming deaf in one ear. Has the repeated use of the telephone anything to do with the increasing deafness?" Considering how deaf President Cleveland remains to the public demand for the removal of Mr. Garland, it may be that he has been using the telephone excessively with both his ears.—*N. Y. Tribune.*

The Graphophone.

At the laboratory of Prof. A. G. Bell Washington, D. C., Prof. Taintor has just given a private exhibition of his curious invention, the graphophone. The machine is an improvement on the Edison phonograph. It is of the simplest construction, consisting apparently of a small brass cylinder and a couple of rubber-bound wheels connecting with another smaller brass shaft and operated by a small balance wheel with a thumb and crank. On the larger cylinder or shaft is placed a close fitting tube covered with wax and paraffine. On the lower shaft, which is about four inches distant from and parallel with the other, is cut a fine screw thread. On this rests a gutta percha tube, the lower end being fastened to a socket piece, which fits to the threads at the upper end, resting lightly on the wax cylinder. Close inspection shows that the upper end of the gutta percha tube has a small lancet like a knife, and this connects by a fine silk thread with a vibrating diaphragm. To this diaphragm, which corresponds to the drum of the ear, is attached a speaking tube about a foot long, in the flaring end of which the operator talks. As he speaks he turns the wheel, the wax cylinder revolves and the threaded shaft carries the gutta percha lever along the lancet, cutting a fine thread in the wax corresponding with the spiral thread. The depth of the cutting is regulated by the force of the sound waves on the diaphragm through the thread connections. As soon as the operator has concluded speaking the tube or receiver is removed and the pounding tube substituted. The lancet tube is set back at the beginning, the wheel turned and the knife running through the same lines of wax gives back the same sound.

The professor read from a newspaper in a natural tone of voice and the same tone was repeated loud enough to be heard by every one in the room. He then talked in a rich Irish brogue with rising and falling inflections, and the instrument repeated it as many times as it was ground over. Then Mr. Maguire, Bell's private secretary, sang "Annie Laurie" to it. The voice of the singer and every peculiar intonation would have been recognized by those who had ever heard him sing.

The utility of the graphophone is its use as an amanuensis, doing away with stenographic experts. The receiver may be a mere copyist. He sits in front of the instrument and writes from it as fast or as slow as the occasion may require. The wax thread cut on the cylinder is a matrix from which the sound can be taken at any time. The cylinder has a basis of paper and can be mailed and talk reproduced anywhere from a similar machine. Newspaper despatches may be dictated and taken from it by telegraph operators without going through the stenographer's hands and being written out. The machine is about as big as the early hand-sewing machines that were fastened to tables.

*** The instrument report of the American Bell Telephone Company for the month ending July 20th is as follows, with that for the season below:

Month.	1886.	1885.	Increase.
Gross output.	$3,297	$2,047	$1,232
Returned	1,382	2,361	*979
Net output.	$1,897	†314	$2,211
Since Dec. 20	1885-6.	1884-5.	
Gross output.	$24,914	$20,195	$4,719
Returned.	10,644	14,797	*4,153
Net output.	$14,270	$5,398	$8,872

* Decrease. † Loss.

The New York Factory of the Dorsett Conduit Company.

Our readers are now familiar with the fact that the Dorsett conduit, with some changes from the Chicago method where it was first successfully introduced, will be used in putting the wires of New York City under ground. The electrical Subway Commission decided in favor of asphaltum concrete as the best material—an evident endorsement of the Dorsett conduit. The contract was awarded to the Consolidated Telegraph and Electrical Company, which has entered into an agreement with the Dorsett company, by which the latter is to furnish all the material and conduits required by the specifications. Mr. Dorsett, having full faith in the merit of his conduit, and having succeeded so well in the West, decided the first of the year to establish a factory in this city. A suitable piece of property was found at the foot of 20th street, East River, which has been leased from the Consolidated Gas Company. The building is of brick, 66 feet by 200. In the rear is a yard, 200 feet square, fronting on the East River, with dock privileges, enabling shipments to be made by water, if desirable. In the corner of the factory is the boiler-room, containing two 80 horse-power boilers, one furnishing steam for power, the other for heating purposes. These may be used jointly or separately as required. Alongside the boilers is located the apparatus for drying sand, which consists of an inclined rotating cylinder, 6 feet in diameter, and 18 feet long. A separate furnace is used for this purpose, the flame and heat passing directly through the sand, which is continually agitated, forming a miniature sand storm inside the cylinder, as it revolves. After passing through this tube, the sand is at once taken to the top of the factory by a bucket elevator, and carried to the different hoppers by a screw conveyor.

Adjoining the boiler room, and separated from it by a brick partition, is the engine-room, where an 85 horse-power Corliss engine quietly performs its duty. The main floor of the factory is raised five feet above the ground floor, on which the engines and boilers are placed, thus affording room underneath for a line of shafting extending to the rear of the building, and supported by heavy frame work. Upon the main floor are eight mixing pans, having steam jackets, into each of which a ton of material is placed at one time. The thorough stirring and mixing of the asphaltum, sand and chemicals is effected by means of heavy revolving rakes in each pan, driven by gearing from the main shaft below the floor. The material, when at the proper temperature and consistency, is fed into the mould by a pan about 3 inches deep, the false bottom being withdrawn when in position over the mould, the tamp or ram having been previously raised above the mould by automatic machinery. The plunger driven by steam thoroughly tamps and solidifies the material as it is gradually placed in the mould. When a section is finished, 3 feet in length, the steel cores are withdrawn by machinery into the basement, and the mould is then lifted by a crane, swung around and lowered into a cooling tank where it is allowed to remain as long as it is necessary, and when taken out the mould is removed. There are four of these tanks 9 feet long, 5 feet wide, and 5 feet deep, sufficiently large to accommodate two of the largest size manholes. They are kept constantly supplied with a flowing stream of cold salt water pumped from the river. The tanks are built of plank, and are lined with a layer of the conduit material to render them water tight. When fully equipped the factory will contain six of these machines, one being now in operation.

There are four heating pans for the asphaltum, located on the attic floor. These are steam jacketed, and the asphaltum is stirred in them by horizontally rotating rakes, driven by a second line of shafting on the upper floor. Here are also located eight sand bins or hoppers, corresponding with the mixing pans below, from which the sand is drawn as required. The full capacity of the factory will be about 3,600 feet per day of the six hole conduit such as is now being made for the Brooklyn contract. The manholes, as designed, are 4 feet 6 inches long by 3 feet wide inside, and as deep as may be required, being built up of concrete moulded in sections and cemented together with the same material.

The reaction of the chemicals used with the asphaltum produces in a short time the same effect that atmospheric air does by long exposure, but unlike the latter the degree of oxidation can be controlled to a nicety, thus producing a compound with sand of any desired consistency.

The Dorsett Conduit Company have already manufactured seven different forms and sizes of conduits as follows: Seven and nineteen ducts round in form for Chicago, also a ten duct for Chicago, rectangular in form. For Brooklyn they are making conduits having four, six, eight, and ten ducts. They claim, and apparently with reason, that they can make conduits of any size and form.

This company can now furnish the material for the underground system of New York with a promptness that no other company in existence can. They have possessed the means and had that confidence in the merits of their conduit to go ahead, and now with the work in their hands are fully equipped for it

Lightning on the Wires.

"Well, that's about the worst trip I ever had, Mr. Stephens," said Smith Bryce, the Western Union lineman, as he threw his kit of tools upon the floor.

"How's that, Smith?" asked Mr. Stephens, the Western Union manager.

"The lightning was bad. It was terrible. It beat anything I ever saw. It knocked my plyers out of my hands, and one time threw them fifty feet It knocked me down twice, and made me dance a three-minute jig. It took my tools away from me, and laughed at me when I made the second attempt to join the ends of the wire. I tell you I have been in many storms. I have spliced wires in the dark, with lightning running by so rapidly that I could not have seen the wires but for the bright current on them. I have been thrown from the top of a high pole, and I have been made hold my hands wide open by the current on the wire, despite my effort to shut them; but I never had such an experience as I had this morning just before day, four miles this side of Macon. The lightning played along the wires in streams and flashes; it rolled in balls, it jumped in lumps, it cut all kinds of funny tricks, and it resisted nearly every attempt I made to splice the broken places."

"You see," said Mr. Stephens, interrupting the lineman, "that the Macon wire was broken yesterday, and Smith went down the road to fix it, and when he reached the broken wire he was in a thunder storm, and had some tronble fixing it."

"He didn't fix it while it was lightning?"

"Oh, yes; they don't mind a little lightning. It knocks them silly sometimes, and once in a while kills a man. But a lineman gets used to that sort o' thing, and finally plays with lightning as the bird with a snake that is charming it.

"Then a lineman's life is interesting?"

"It is. Now, there's Smith; he has been here during twenty years, and during that time has had more electricity pass through him than would be necessary to tear Atlanta into splinters. Since he has been here two linemen have been seriously hurt and two have been killed. About four years ago we had one killed up the Air-Line road about twenty miles. You see, the wire was in two, and after we had located the trouble the lineman took a helper and went up. They found the broken wire and began splicing it, but while they were at work lightning struck the wire and killed the lineman, and knocked his helper senseless. Why the poor fellow was as black as could be. Then since then Smith went out on the State road with another lineman, and while they were at work lightning hit the wire and killed the lineman, and Smith came home badly used up. Why, just where the men were working that time it was as clear as crystal. There was not a cloud to be seen, and the lightning which killed the man was twenty miles away."

"Twenty miles away!"

"Yes, twenty miles away. The men were working near Big Shanty, and way up above Cartersville a big storm was raging. The lightning struck the line and followed it for twenty miles, when it came to the end of the wire, which the lineman was holding in his hand, and killed him."

"Yes," said Smith, "I had hold of the wire, too. He had it at the end, and the shock passed over the wire through my hands before it reached him. Why, the instant I felt it my hands sprung wide open, and before I could look around the poor fellow was on the ground dead, and I was whirling like a whirlwind."

"Then a lineman's life is in danger?"

"Constantly. He is always at work and always ready to go. You see, we measure the telegraph wires by ohms—not inches, feet or miles. For instance, the wire from here to any point is so many ohms. Now, if we have any trouble in securing connection, say with Chattanooga or Macon, an operator goes to the instrument and tries the 'pressure.' If it shows half the number of ohms the wire is entitled to we know the wire is down, broken, or out of order half way to Chattanooga. The lineman is called up, and told where the trouble is. He takes a dozen glass insulators, a coil of one hundred feet of wire, a saw, hatchet, and other tools and boards the first train. May be he was just returned from a three or four days' trip, and is tired and hungry. This makes no difference. The wire must be fixed, and, without seeing his family, he jumps on the first train and goes. As he nears the place where the trouble is located he pulls the bell cord, the train stops, and he jumps off. It may be at the dead hour of night, or it may be at noon. It may be clear or it may be raining hard. It may be warm or it may be cold. It may be in an open field on it may be in the woods. These things the lineman can't control, and after he hits the ground he hunts the broken place, mends the wire, and sits down on the cross tie until a train comes along. He don't care which way that train is going. He wants to get out of the woods, and, without ceremony, flags the train down and gets on."

"But don't the railroad company object?"

"Oh, no. You see we have a contract with all the railroads which allows us this right, and it is the secret of the W. U.'s success."

"Do the linemen pay their fare?"

"No, they have annuals. Now, there's Smith—the only colored man in the South who has annuals over all the roads in Georgia—with a pocketful of annuals."—*Atlanta Constitution.*

Direct Cable to Brazil.

The offices of the Pedro Segundo American Telegraph and Cable Company, at No 44 Broadway, were opened yesterday. This company is organized for the establishment of direct cable communication between here and Brazil. A contract has been made for the cable, and it is to be in working order by January. The following compose the officers and board of directors: H. K. Thurber, president; Edward R. Bacon, first vice-president; Charles R. Flint, treasurer; De Borden Wilmot, secretary; Joseph Edward Simmons, Francis A. Bassler, Charles H. Sandford, John C. Redman and Henry W. Cannon, directors.

The cable will go from the United States to Hayti, thence to Curacoa, and from there along the Venezuelan coast to Cayenne, in French Guiana. From there the cable will be continued to Para, where it will communicate with the Government land lines of Brazil. The cable will connect at two points with the land lines of Venezuela. Salvador de Mendonca, the Brazilian Consul-General, presented to the company at the opening of the offices a large oil portrait of Dom Pedro. It hung on the wall covered by the Brazilian and American flags, and was unveiled by the Emperor's grandson, Prince Augusto.

TELEGRAPHIC

.... The Electric Underground Conduit Company, of Portland, Me., has been organized with the following officers: President, George F. Milliken; treasurer, Frank J. Milliken; directors, George F. Milliken, George H. E. Trouvelot, Warren D. B. Smith, Frank J. Milliken. Capital stock $300,000; paid in $45.

.... The Municipal Signal Company, of Boston, has had its system adopted at Station 6, South Boston, thirty-three street stations being used. This system is a most excellent one, invented by John C. Wilson, president of the company, and consists of telephonic and automatic intercommunication between the officer on his beat and his station-house.

.... The Baltimore and Ohio Telegraph Company have introduced a system of commutation books for the convenience of their patrons. The books contain stamps of various denominations similar to postage stamps. These stamps affixed to a message are received at the telegraph office in payment as money would be, and are sold bound up in books at a discount. Eleven dollars and four cents worth of commutation stamps are sold for ten dollars.

....During a violent thunder storm which recently broke over a country town in France a curious incident happened. A young woman caught in the storm was hastening homeward, sheltering herself as best she could beneath an umbrella from the drenching rain. Suddenly she experienced a strange and alarming sensation, the shock being simultaneous with a very vivid flash of lightning. She felt "quite upset, greatly alarmed," but nevertheless proceeded on her way, and it was only on reaching her residence that she discovered what a narrow escape she had had. On removing her bonnet she found that her hair had been literally cut off, her head presenting, as the hair fell, the same appearance as though it had been shaved with a razor. The effect upon the girl's mind of the discovery was so great that she has been confined to her bed ever since the day of the storm. It is not the loss of her hair that affects her, but the recollection of the narrow escape she had has so entirely upset her nervous system that the medical men attending her express the opinion that it will be some weeks before she recovers from the shock.

.....John Z. Hibbert, of Galveston, Texas, is reported to have had all the experience with lightning that he desires. Hibbert is a magnificent specimen of youthful manhood, standing over six feet two inches in height, and weighing in proportion to his size. Recently he was passing through a severe storm, when suddenly the heavens seemed to open and a great flash of lightning descended. Hibbert after that lost consciousness. A negro man, who was passing in the street, describes the immediate sequel. He saw the body of a man lifted from the ground. For a moment it stood out in broad relief against the sky, and then, as darkness again overspread the weird scene, the body descended fifty feet away. Affrightedly the man ran off and gave the alarm, but when he returned Hibbert was gone. In the meantime Hibbert, partly recovering, groped his way home and fell on the floor. His face and body were black, all the hair was scorched off his head, while his face was mutilated and bloody. A bruised spot on his forehead ran downward into a jagged cut in the bridge of his nose. His upper lip was split, one of his front teeth broken, cutting into his under lip. For three hours Hibbert lay semi-unconscious and blackened, until, yielding to the treatment of Dr. Randall, he has regained his normal condition, and at last accounts was in a fair way of recovery. While it is believed that the bolt descended first on his forehead, continued on its way down his breast, the most likely theory is that he received the full force of the stroke on his chest, and the bruises about the face were caused by the violence with which he fell among the debris.

ELECTRICAL AND SCIENTIFIC

* * General Manager Hosmer, of the Canadian Pacific Telegraph Company, states that his company had concluded a contract with the Mackay-Bennett system, and that connection between the two companies would be established about the middle of August. It is stated that the Western Union has been making efforts to balk these negotiations, and that Dr. Norvin Greene, who has been in Montreal for the last few days with this object in view, has returned to New York, his mission having been unsuccessful.

* * The Daft Electric motor, Benjamin Franklin has been removed from the 14th street station of the Ninth Avenue Elevated road, and a new motor of twice the power of the first one is being placed in the car. The first motor represented about 60 horse-power, and while it could easily manage a train of two cars, it was unequal to pulling four cars when loaded with passengers. The new motor will represent 120 horse-power, and Mr. Daft expects to have it ready in a month. He will then renew his experiments and again endeavor to make a practical showing for electricity on the elevated lines.

* * The electric motor on the Ridge Avenue line, in Philadelphia, was tested last week, and reported very successful. The car made several trips. The electric power is generated by an 8-horse-power dynamo in the depot, and is supplied to the motor under the car through copper conductors placed in a slot in the middle of the track. A "traveler" is arranged in this opening, through which the current is conveyed to the motor from the rail. The car can be moved either forward or backward, and by the same lever which governs the motion it can be stopped without the use of brake. A safety brake is, however, provided by which it can be stopped in its own length. The vehicle is lighted by six electric lamps.

* * Among the manuscripts recovered from the wreck of the Oregon was one containing a valuable record of scientific research. M. Strobant, a Belgian astronomer, made last year numerous observations of the relative brightness of the stars. Knowing that special attention had been made to similar work at the Harvard College Observatory, he offered to send a copy of his observations to Cambridge for discussion and publication. This offer was accepted, and the manuscript was sent, but unfortunately it was carried by the Oregon, and was supposed to have been lost by the sinking of that vessel. But after remaining under water for 15 weeks it has been recovered and sent to the observatory. Although somewhat stained, it is perfectly legible, and discussion of the results to be derived from it has already been begun.

* * The scientific editor of the San Francisco *Chronicle* is disposed to view with sanguine eyes the prospect for great inventions. The following appears in a recent issue of the paper: "And yet there are great discoveries in course of evolution which are destined to revolutionize the world, and to pile up fortunes for their patentees compared to which the colossal wealth acquired by the owners of the Bell telephone will seem trifling. Take the one subject of aerial navigation. A hundred years have elapsed since Montgolfier demonstrated the navigability of the air. The missing link with him was the power to direct his balloon. Fifty years afterwards John Wise believed he had discovered the secret; he declared that the air lay in strata, in some of which the wind was invariable. The defect of his theory was that his premises were false—there is no aerial stratum in which the wind is invariable. Since 1880 Captain Krebs and others in France and Germany have actually constructed dirigible balloons. Captain Krebs made four miles an hour against the wind. Of course, this is not very fast traveling; but the first railway carriage only made six miles an hour. If Krebs can sail four miles an hour against the wind, he can, by perfecting his machinery, sail forty. When he does, railroad passenger travel will be at an end and the age of aerial travel will begin."

New Acid Gravity Battery.

The Partz Electric Battery Company, of Philadelphia, are manufacturing the above battery. In this the gravity principle is applied to voltaic apparatus of the Bunsen type in a way similar to that in which it has been applied to apparatus of the Daniell type. When using an ordinary Bunsen or Poggendorff battery, in which carbon cathodes are depolarized by either nitric or chromic acid, one is obliged, in order to obtain its full effect, to supply it with the normal quantity of acid, for however short a time it may be wanted, and unless it be taken apart after having done its work, the liquids, vertically separated by permeable partitions, will soon diffuse and material be wasted. On account of their saving the trouble of removing and emptying the porous clay cups, "dip-batteries" on Grenet's plan, variously modified, have become the favorite means of generating strong electric currents for temporary applications, though the periods of their employment are inconveniently limited by a speedy decrease of power. The Acid Gravity Battery may be supplied with the depolarizing material from time to time according to the work it is designed to do and without interrupting the same. It seldom requires to be emptied and, unless it be left unused for weeks or months, the zincs may remain in the liquid. The E.M.F. of a cell is about 1.95. The manufacturers give its strength of current, as follows:

With a solution of sulphate of magnesia..... 3 amperes.
With a solution of chloride of sodium..... 5.5 amperes.
With a solution of chloride ammonium..... 6 amperes.

An addition of 10 per cent. of hydrochloric acid increases the strength of current of a cell:

With a solution of sulphate of magnesia to..... 5.25 amperes.
With a solution of chloride of sodium.....6.6 amperes.
With a solution of chloride of ammonium.....7 amperes.

The Acid Gravity Battery has proved of excellent service in its application to electro-magnetic dental mallets, which are satisfactorily operated by four cells. Its efficiency and great convenience render it equally well suited for surgical and dental glow lights, for cautery (from 4 to 6 cells), for electro-plating by jewelers, watchmakers and amateurs, and it is well adapted to the wants of a chemical or physical laboratory.

NEW ACID GRAVITY BATTERY OF THE PARTZ ELECTRIC CO., PHILA.

Electric Light in Northampton.

The electric light situation in Northampton, Mass., is not devoid of interest. Two companies, the Thomson-Houston and the Schuyler, are occupants of the field, the latter company having the greater number of lights. Both companies are reported as having admitted, prior to the awarding of the contract, that the city was not large enough for two companies. A committee of the Mayor and two aldermen finally decided in favor of the Schuyler. The Thomson-Houston had meanwhile secured permission to erect poles and run wires. Bids were, after this action, advertised for, which resulted in the Board of Aldermen giving the contract to the Schuyler Company, and the Board of Councilmen to the Thomson-Houston Company, and both companies are running lights there to-day. At a recent meeting of the City Council the following spirited discussion ensued:

Alderman Hill—The electric muddle has brought the city council into disgrace at home and abroad, and it is the subject of constant slurring at all times. If legal ability cannot settle it, let's take the laws into our own hands.

The Mayor—The only way to settle the question is to have a joint conference, as one board favors one company and the other the other company.

Alderman Brown—Why not have a joint convention and let each member express his opinion?

The Mayor—If both companies continue to cut each other's throats and give the city the advantage, let the good work continue.

Alderman Brown—I want to save the city from the disgrace, and do not see why we cannot in some way settle this matter.

Alderman Wood—Taking the worst view of the case, that the city will have to pay both companies, we would be getting our lights cheaper than if only one company had come in.

Alderman Crafts—It certainly will not cost us much to light the streets next year. We have got the disgrace, but it did not cost us much to get it.

Alderman Hill—It is this disgrace which annoys me, and if we can settle it by a joint conference let us do so.

Alderman Wood—We ought to compel one company to put up respectable poles and make the other company use the same poles, and then if they want to fight let them go ahead. The poles now up are a disgrace to the city.

Alderman Hill—I move that three from this board and four from the lower board be appointed on the joint conference. This motion prevailed.

It is to be hoped that these two excellent companies will succeed in arranging matters amicably, and that the one with the best right to the field will be privileged to remain in possession of it.

—— A plant of 35 lights was recently placed, by the American Electric Manufacturing Company, at Asbury Park, N. J.

Digest of U. S. Patents on Storage Batteries.

REFERENCES TO FOREIGN PATENT OBTAINED THEREON.

1883.

274,373. Mar. 20, 1883. Filed July, 13, 1882.
English pat., No. 5,451. Dec. 13, 1881.
French pat., No. 146,420. Dec. 19, 1881.
Belgium pat., No. 56,544. Dec. 21, 1881.
James Pitkin, London, England.

Consist in forming each electrode of a mass of very thin turnings, shavings, strips or pieces of lead, or of highly laminated sheets of lead in a crumpled or entangled condition packed in an open frame of wood or ebonite, and enclosed within a covering of felt, flannel or other suitable porous fabric. The body of the electrode is connected with the terminal by means of a rod of lead divided into a number of narrow leading strips or branches, which are distributed uniformly through the mass of the electrode.

274,802. Mar. 27, 1883. Filed June, 29, 1882.
A. J. Martin, Catskill, N. Y.

Relates to a compound electrode consisting of a plate of lead, of twice the required size for the electrode, doubled and between the inner surfaces of which is placed a sheet of conducting metal, such as copper. The lead sheets may be perforated, corrugated or of dove-tail section, so as to increase their surface. Electrodes so made are arranged vertically in the containing case separated from each other by means of interposed plates of fibrous material, such as asbestos board.

274,865. Mar 27, 1883 Filed Dec., 1882.
S. J. Wallace, Keokuk, Iowa.

The device described is very complicated, and combines a primary battery, a secondary battery and a gas battery. The claim is for "the process of generating electricity and chemical action, which consists in forcing into a generator of two cells and containing an active electrolytic fluid and two electrodes, which have cavities, pores, passages and intricate interstices, air into one cell and hot electro-positive gases containing hydrogen and sulphurous oxide ($S O_2$) into the other cell in such way that the cases will rise up through the fluid and will carry up the fluid, so that it will be in contact with both the gases and the electrodes above and below such level in the cells, respectively, and then forcibly intermixing the fluid, gases and electrodes by mechanical motion, to cause the union of the gases and the action of the electric current."

274,905. April 3, 1883. Filed May 27, 1882.
Charles F. Brush, Cleveland, Ohio.

Two or more strips or bars are arranged vertically and connected together at the top, or top and bottom, to form a plate. When the plates are assembled in a cell, the edges of the bars or strips of contiguous plates are opposed.

275,985. April 17, 1883. Filed June 9, 1881.
Charles F. Brush, Cleveland, Ohio.

Plain or ribbed plates are included within a frame of insulating material, which will not be acted on in the battery, and which are so united to the plates as to form water-tight joints; a number of such plates and frames are assembled and bound together by bolts, the plates at opposite ends acting as terminals. The supporting frames are thicker than the plates, and so insulate contiguous plates from each other.

Claims the combination of a series of plates or elements made cellular, grooved or ribbed, and furnished with an active coating (lead oxide), with strips arranged to separate and insulate and form separate open top cells, etc.

275,986. April 17, 1883. Filed May 27, 1882.
Charles F. Brush, Cleveland, Ohio.

Metallic lead in a pulverized, granular, precipitated, or other finely-divided state, and having the surface of the particles oxidated, is placed in a convenient mould, and submitted to pressure to form an electrode, or one or more faces of a cast or rolled plate of lead, or other suitable substance, may be covered with the oxidized particles of lead, which are forced into contact or incorpo-

rated with the body of a plate by pressure. The supporting plates may be plain, scored or perforated.

276,099. April 17, 1883. Filed Aug. 17, 1882.
C. J. Van Depoele, Chicago.

The electrodes are lead saucers and spirals, arranged horizontally and alternating. They are first treated to form a nitrate of lead upon their surfaces, which is afterwards converted into peroxide and spongy lead. Black oxide of manganese may be employed to form a double oxide of manganese and lead.

276,155. April 24, 1883. Filed June 9, 1881.
Chas. F. Brush, Cleveland, Ohio.

The electrodes are in the form of bent, folded or corrugated plates, so arranged in the containing vessel that their folds or corrugations will enter each other. An active layer is electrically deposited (formed) or mechanically applied.

276,300. April 24, 1883. Filed Dec. 5, 1882.
Eli T. & E. E. Starr, Philadelphia, Pa.

The construction of the batteries is the same as that described in U. S. Patent No. 268,308, same inventors.

The claims are for a compound electrode, consisting of a mass of finely-divided active material, supported at its opposite side by perforated plates or at its edges by a non-conducting support.

Division No. 2 of application filed December 31, 1881.

276,301. April 24, 1883. Filed Jan. 8, 1883.
Eli T. & E. E. Starr. Philadelphia, Pa.

Same construction as Nos. 268,308 and 276,300.

Claim.—An electrode supported above the bottom of containing vessel, and provided with tubes or spaces in the body of electrode, so arranged as to allow escape of gases, etc.

Division No. 3 of application filed December 31, 1881.

276,348. April 24, 1883. Filed June 13, 1882.
Chas. F. Brush, Cleveland, Ohio.

The electrodes have a core or body of non-oxidizable material, such as gold platinum or "equivalent substances," and may be of any convenient shape, such as plates, strips, etc. Upon the core is applied a coating made primarily of oxide of lead or a mixture of metallic lead and lead oxide. The core may be of the filament form, and the active coating surround it as a tube. To insure the adhesion of the coating, the plates or strips may be corrugated, pierced, embossed or roughened.

Success of the Waterhouse Electric Light in Hartford.

A recent issue of the Hartford *Courant* contains the following concerning the Waterhouse Electric Light Company:

"Hartford may well feel proud to number among its industries a corporation that has so complete a system of electric lighting, and we take pleasure in noting its successful operation on the streets of our city. The Waterhouse Electric and Manufacturing Company was incorporated by the legislature at its last January session, has its factory at Colt's west armory, and its stockholders are a number of our successful manufacturers and business men. The officers of the company are: Asa S. Cook, president and treasurer; S. W. Bishop, vice-president; Charles E. Chapin, secretary; A. G. Waterhouse, electrician. The directors are: Asa S. Cook, S. W. Bishop, Francis A. Pratt, Charles E. Billings, A. G. Waterhouse, S. O. Prentice, and George M. Bond. The company has a solid financial backing; five of its directors are mechanical experts, and, added to this, the Waterhouse system is considered by good judges "a decided advance in the art."

"The Waterhouse arc system produces a brilliant, steady light, superior in every respect, and entirely suitable for out and indoor lighting; the latter especially on account of its steadiness. But while a steady light is a most important result, there are other equally important features in a system to readily attain what could be called advancement over what is in the field, viz: regulation of the current, simplicity and reliability of the lamp, and economy of power required to operate the system.

"The Hartford Electric Light Company have held tenaciously to the system that they have been lighting the city with heretofore, believing it to be the best, and it does stand high; but they are anxious to furnish the best light in the word, and it was the prospect of improvement that led them to give the Waterhouse system a trial. At their station they now have two of the Waterhouse generators on a circuit of forty-five lights. These can be seen on the park and on Main street north of Mulberry. The ease, perfection and harmonious workings of the new system are apparent to those unfamiliar with the subject. Everything works together. The regulator keeps the current constant, the lamps have great feeding powers, the light is most brilliant and steady, and the power required is the wonder to the experts. It is admitted that a full arc light of the several great systems of our country requires about a horse-power to maintain it, and on two systems they take a horse-power and a quarter per light; but the average is about a horse-power. Now the Waterhouse system figures practically less than half a horse-power per light, and the indications, taken direct from the engine, prove it so; while for penetrating distance they are up to standard, and the claim of the company, that their lights require but half a horse-power per light (full arc) is sustained. The Waterhouse system, complete in its details and fully covering the features so necessary for a perfect working system, has this great saving of power, which is an incontrovertible argument in its favor."

—— About twenty-five arc lamps of the American system have been started this month at Old Orchard Beach.

—— A pair of swallows have built a nest in the hood of an electric lamp on the streets of Bloomington, Ill. The light-trimmers raise and lower the lamp carefully, and the mother-bird does not appear to be afraid of them. The brilliant illumination at night does not disturb her in the least, and she sits contentedly on her nest while the light is burning.

Engine and Dynamo and Dynamo Case.

The two cuts on this page illustrate some excellent ideas that have been carried out by our English brethren. At the Paddington installation the dynamo and engine are set up in the compact form shown in Fig 1. The dynamo is of the Crompton type, what are usually called slow-speed machines. The dynamo is driven direct by high-speed Willans engine, running at about 450 to 500 revolutions per minute. The armatures of these machines consist of copper bars. In Fig. 2 is shown an ingenious arrangement which has been devised at Paddington, and which performs the double function of reducing the noise produced by the dynamos, and at the same time ventilating the building in which they are worked.

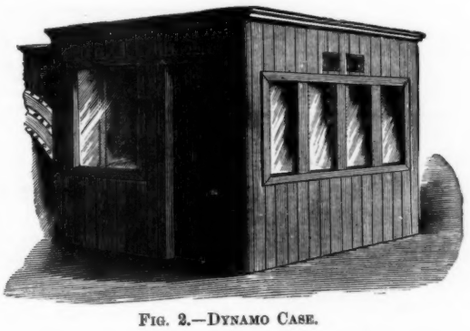

FIG. 2.—DYNAMO CASE.

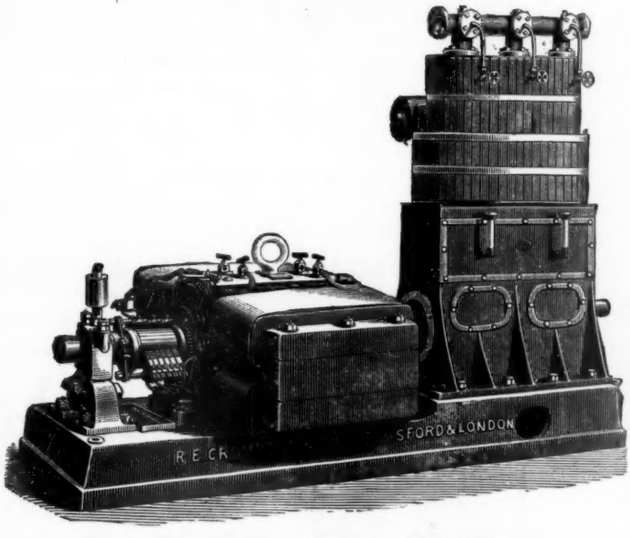

FIG. 1.—CROMPTON DYNAMO, DRIVEN BY WILLANS ENGINE

This has been satisfactorily accomplished by incasing the dynamos in a structure of double wood and felt casings (Fig. 2), with double glass windows, made in such a way that the dynamos act as their own fans, withdrawing the air, and with it the noise, from the room, and afterwards expelling the air through wire gauze screens, and discharging it on the railway line away from the houses. Thus, a circulating current of fresh air is continually kept up in the chamber, maintaining in it a cool, equable temperature, an appreciable advantage to both the workmen and machinery.

—— Work on putting in the additional electric lights in the Government building, at Chicago, will be commenced in a few days.

—— The illumination of cotton and woolen mills by the arc system is now receiving marked attention at Lawrence, Mass. Within the past three months a plant of 300 improved American lamps has been installed in the Arlington Mills, and an order for a plant of 50 lamps for the Washington Mill now rebuilding under the energetic guidance of Thomas Sampson, Esq., formerly of Providence, who has recently assumed the management. The American Company's system is thus successfully occupying the exacting fields with entire acceptance.

ELECTRIC LIGHT NEWS

—— There are 1,600 electric lights in use in the city of New Orleans, all connected with one station.

—— The Illuminating Company of Philadelphia has been organized recently for producing and supplying electric light to the public and private consumers.

—— The Grinnell Electric Light Company, of Grinnell, Iowa, has been incorporated. Capital stock, $20,000. President, Willard Kimball.

—— The Minonk Electric Light Company of Chicago, Ill., has been incorporated. Capital stock, $4,000. M. T. Arms and others, incorporators.

—— The Port Jervis Electric Light Company, of Port Jervis, N. Y., has been incorporated. Capital stock, $30,000. Geo. M. Beebe and others, incorporators.

—— The city fathers of Orange, N. J., have contracted with Mr. R. T. McDonald, of the Fort Wayne Jenney Company, for a plant of 75 lights to be used in lighting the city.

—— The city of Woonsocket, Mass., is now lighted by 41 public lights. The contract for street lighting by the Electric Light and Power Company, of that city, has been accepted by the Council.

—— The Electric Club, of New York, has chartered the steamer Aeronaut for a cruise to the Fishing Banks, Saturday (July 31st) of this week. The steamer leaves the pier at the foot of Franklin street, North river at 9 A.M., sharp, returning in the evening.

—— The Worcester (Mass.) Electric Light Company is arranging to put into the works one of the new Thomson-Houston incandescent dynamos, to furnish Messrs. W. E. Cash, Day & Morse and W. L. Davis with incandescent light. If these prove a success as they will, other business firms will take the light.

—— There was sharp competition between the Consolidated, Mather and Edison companies for the lighting by incandescent lamps of the large drygoods house of Stern Bros., on Twenty-third street, New York city, the contract finally being awarded to the last-named company. The plant will be quite extensive.

—— The Phœnix Glass Company, of New York city, under the energetic management of Mr. A. H. Patterson, is rapidly securing a prominent position in electric-light circles. This company is furnishing a fine article of globes, both arc and incandescent, and that the electric light companies appreciate this fact is evidenced by the increased business reported. In addition to the staple class of flint and opal globes, shades, etc,, for electric light purposes the Phoenix Glass Company of New York have given special attention to the introducing of novel effects—at the same time keeping in mind the practical—in both arc and incandescent globes and shades. Their line of the latter is certainly the most varied and the most extensive presented by any single manufactory in New York, embracing opalescent, coraline, ivory, pearl and other effects and combinations of colors. The opalescent large electric globes used in Delmonico's ball and banquet rooms were made by this company, which was the only factory possessing the facilities for making such large globes as the designs called for. Among the many places using the Phoenix goods, space permits mention of only a small number: residence of G. W. Stockly, Esq., Cleveland, Ohio, President of Brush Electric Light Co.; Detroit Opera House; Hamburg-American line steamers; Delmonico's down town restaurant; Brunswick Hotel. This company is now making an order to ship to a prominent electric light company, London, England. They extend an invitation to all interested to call at their show room, 729 Broadway.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JULY 20, 1886.

345,700 Safety automatic brake; Frank E. Kinsman, New York, N. Y.

345,719 Art of splicing cables; Thomas C. Nash, Chicago, Ill.

345,720 Vibrating electric motor; Albert L. Parcelle, Boston, Mass., assignor to the National Electrical Company, New York, N. Y.

345,721 Electrical synchronous movement; Albert L. Parcelle, Boston, Mass., assignor to the National Electrical Company, New York, N. Y.

345,755 Electrical Indicator; Charles Wirt, Chicago, Ill.

345,756 Electric battery; Charles Wirt, Chicago, Ill.

345,762 Telephone transmitter; Grant Brambel, Havana, N. Y., assignor of one-half to Fred James Dunham, same place.

345,838 Apparatus for demagnetizing watches Charles K. Giles and Richard E. Fenner, Chicago, Ill., said Fenner assignor to said Giles.

345,845 Electric railway; John C. Henry, Kansas City, Mo.

345,860 Apparatus for carbonizing fiber; Albert L. Reinmann, Pittsburgh, Pa.

345,880 Circuit controlling key for incandescent electric lights; Arthur G. Brown, Brooklyn, N. Y., assignor to George Westinghouse, Jr., Pittsburgh, Pa.

345,884 Cash carrier; Chas. E. Chinnock, Brooklyn, N. Y.

345,937 Electric arc lamp; A. G. Waterhouse, Hartford, Conn., assignor to the Waterhouse Electric Mfg. Co., same place.

345,956 Machine for covering insulated wires with lead; Asahel K. Eaton, Brooklyn, N. Y.

345,998 Gas engine; Reuben F. Smith, Atchison, Kansas.

346,020 Circuit controlling key for incandescent electric lamps; Arthur G. Brown, Brooklyn, N. Y., assignor to George Westinghouse, Jr., Pittsburgh, Pa.

346,031 Telephone; Julius Emner, Jr., Washington, D. C.

346,032 Galvanic Battery; Theodor Erhard, Stuttgart, Wurtemburg, Germany.

346,053 Electric battery; Orazio Lugo, New York, N. Y.

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ELECTRICAL CASES A SPECIALTY.

SPECIAL NOTICE.

National Electric Light Association,

SEMI-ANNUAL MEETING.

THE FOURTH MEETING—semi-annual—of the NATIONAL ELECTRIC LIGHT ASSOCIATION will be held at DETROIT, MICH., on Tuesday, 31st day of August, at 10 o'clock, A.M. Dues being payable in advance, all members are required to forward the same for the year 1886, by check or otherwise, payable to the order of J. F. MORRISON, President, Baltimore, Md.

Electric Light Companies and Manufacturers of Electric Light Apparatus, Supplies, &c., desiring to become members, must apply on or before August 31st, to the President, J. F. MORRISON, Baltimore, Md.

Members and others desiring information as to R.R. transportation rates will address J. F. NOONAN, Esq., Chairman Com. on Transportation, Paterson, N. J.

Special Hotel rates will be made known previous to meeting of the Association.

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Fig.259

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Fig.255

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Fig.260

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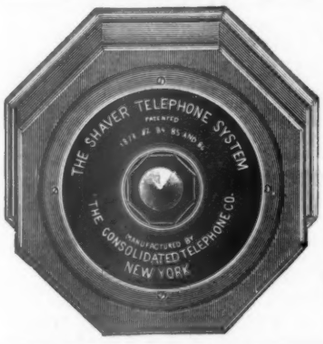

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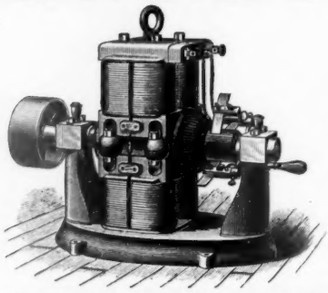

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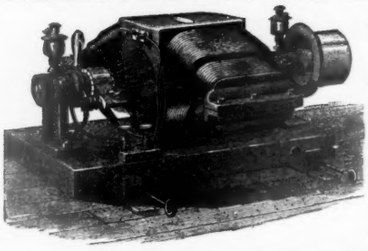

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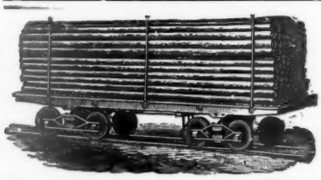

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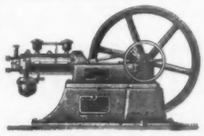

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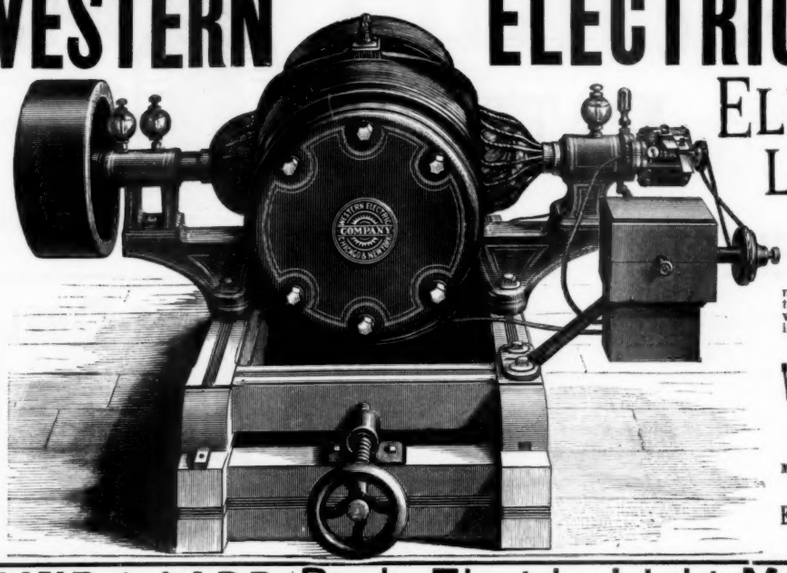

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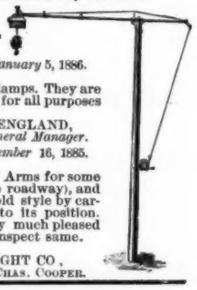

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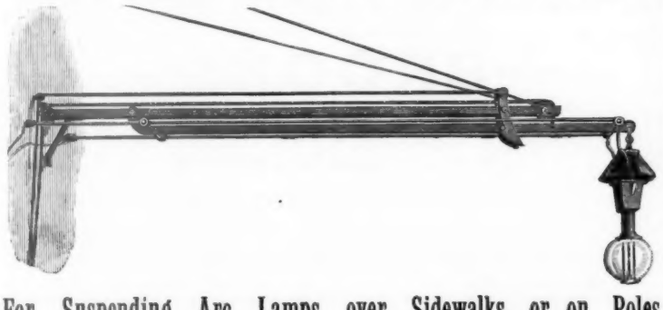

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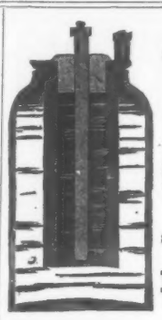

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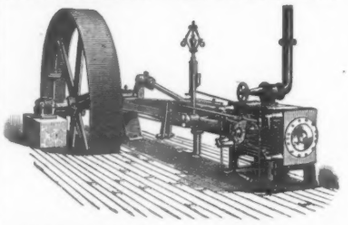

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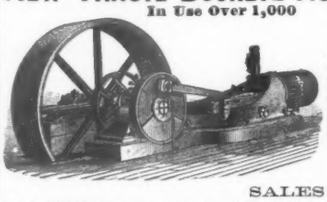

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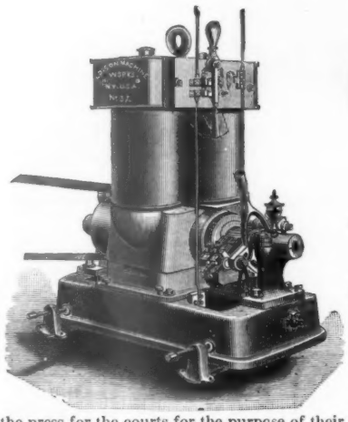

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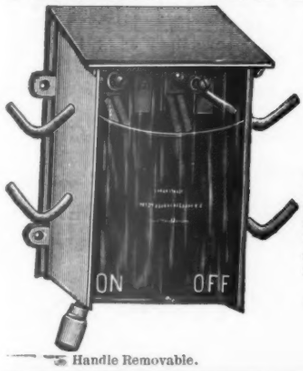

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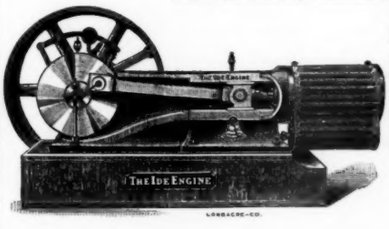

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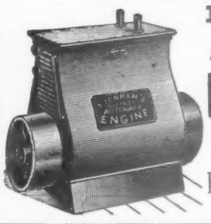

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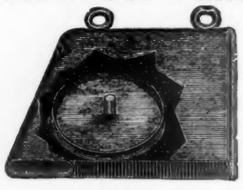

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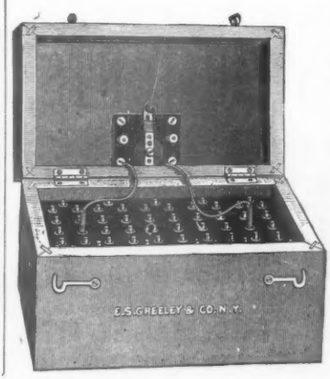

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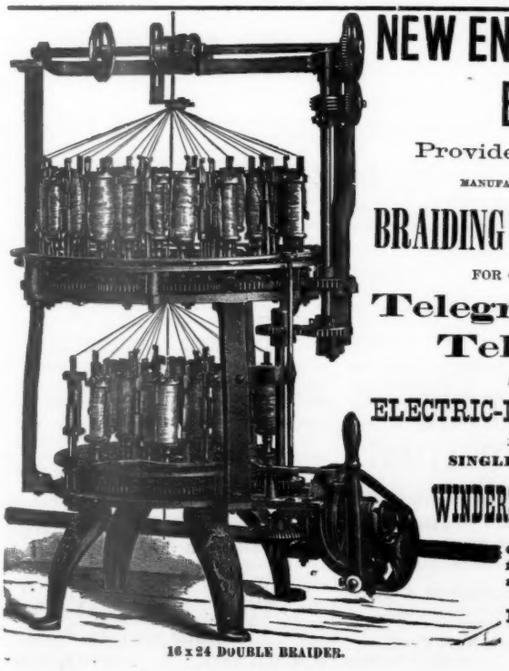

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